ELECTRICAL REVIEW

Vol. CXLVIII No. 3822 23RD FEBRUARY, 1951

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

The Home Front

FURTHER ANALYSIS OF LOAD SAMPLING

THERE is a stipulation in the Electricity Supply Act of 1947 that methods of charging for electricity should be simplified and standardized. In this way it followed up, but with statutory implications, the aims of several exploratory committees from 1926 onwards. So far only two Area Boards—the South West Scotland and the South Wales (in one Sub-Area)—have introduced single domestic tariffs to replace the large numbers previously in force.

More Detailed Classification

This is not surprising, in view of the complexities and thorny nature of the subject, as is evident from B.E.A. Utilization Research Report, No. 4,* which makes a further analysis of the sampling survey of 50,000 domestic installations undertaken in 1946 by the Electrical Research Association. The usefulness of that document has been appreciably increased through the application of a punched-card system, which has permitted a more detailed classification of the returns. Statistics are scheduled under headings relating to urban and rural areas, north and south of the United Kingdom, and credit and prepayment meters, the kWh used being divided into four classes according to floor area.

Conditions have considerably changed, as the authors point out, since the original survey was made. Also the present position is artificial as a result of such restrictive influences as shortage of generating and distribution plant, purchase tax on consumers' equipment and suspension of active propaganda. Nevertheless, the report gives valuable indication of trends of progress. Thus the potential field for heavier appliances is suggested by the high proportion, 20 per cent, of consumers still supplied at the lighting flat rate. The effect of competition from other methods is reflected in the higher rate of cooker saturation in the countryside—about twice that found in towns.

Order of Use

The greatest energy-using appliance is the electric heater, but water heating appears to be gradually approaching the cooker, which comes second. The seasonal nature of space heating is, in our view, not without its advantages in providing a margin for plant overhaul in the summer, but we would like to have further information that showed

* A Further Analysis of the Returns of the E.R.A. Sampling—Survey of Domestic Consumers, by P. Schiller and W. A. Pridmore, B.E.A., British Electricity House, Great Portland Street, London, W.1.

promise of reducing irregular winter peaks. Price per kWh seems to be less of a determining factor than it was at one time and its importance will no doubt decline as the convenience and other merits of greater electrification are more widely experienced. Two-part tariffs now in force encouraged the greater use of kWh per kW installed and were designed to cover approximately standing and running costs for domestic consumers as a whole. Higher capital charges and fuel costs may call for some reassessment unless load factor is raised considerably. On the whole a variable block-rate tariff appears to us most likely to give the requisite flexibility combined with simplicity. More data are still required for many purposes. Valuable as is the record provided by the report under review, the information it gives is admittedly derived from too few cases to be truly representative.

INSTALLATION STANDARDS

In the *Electrical Review* of 9th February Mr. H. R. Taunton suggested a simplification of electrical installations without interfering with safety or efficiency. For this he is taken to task by Mr. Alex. Milne in a letter published in this issue. In this connection it is worthy of note that the British Electricity Authority has a "Working Party" considering a draft of the 12th edition of the I.E.E. Regulations with a view to recommending "specific points (if any) upon which they consider some easement of the Rules desirable to obtain a saving in cost without any diminution of the safety standard and thus to make them suitable for universal acceptance as the minimum standard." This links up with the proposed National Inspection Council upon which some notes appear on page 386.

TRANSATLANTIC CONDITIONS

Evidence of the will to profit by experience of other countries was forthcoming during the discussion at the meeting of the E.P.E.A. (London Technical Group) last week. Mr. C. L. Jaques, as a member of the B.E.A. team which visited the United States, "dotted the i's and crossed the t's" of many items relating to generation in the Anglo-American Productivity Report. His questioners seemed chiefly interested in the successful results of preventive maintenance. Impressive as the achievement of modern American practice undoubtedly is, there is, as the lecturer stated, "no magic in it." It is rather the result of determination to take the fullest advantage of an abundance of natural resources and favourable large-scale operating conditions, backed by a persistence of the old-time frontier spirit.

EUROPEAN POWER STATIONS

With less favourable operating conditions, European manufacturers have had less scope hitherto. A new O.E.E.C. publication, however, entitled "Note on the Thermal Development of Thermal Power Stations" gives particulars of installations, new and under construction, of advanced design that may be better suited to future requirements of their clients. An example of this is found in the experience gained over many years in designing power stations for using low-grade fuel with high ash content—a practice which, as Mr. Jaques pointed out, the U.S.A. has not been forced to develop.

CONSUMER DEMAND

The method of examination which is explained under the above heading on another page will doubtless be thought too "scientific" by some of our readers. They may perhaps consider it more suitable for a statistical journal. However, the article certainly represents original work with an interesting bearing on the analysis of consumer demand in the electricity supply industry. It may also serve the incidental purpose of directing attention to the merits of logarithmic probability paper, which seems to have had little consideration, for graphical representation of statistical data.

STILL DEARER COAL?

Lord Hyndley stated last week that the latest increase in the price of coal (4s 2d a ton) was intended to cover higher wages and other costs and compensate for loss of exports. It was unlikely to do more than enable the National Coal Board to make ends meet in 1951. He admitted that this flat rate increase was not consistent with the Board's aim of a reformed price structure and "adjustments upwards and downwards will be made in the next instalment of the price structure." This may, or may not, be good news for the British Electricity Authority, which has already given a preliminary warning to consumers that electricity is to cost more.

Scottish Textile Works

Private Generation Hydro-Electric Scheme

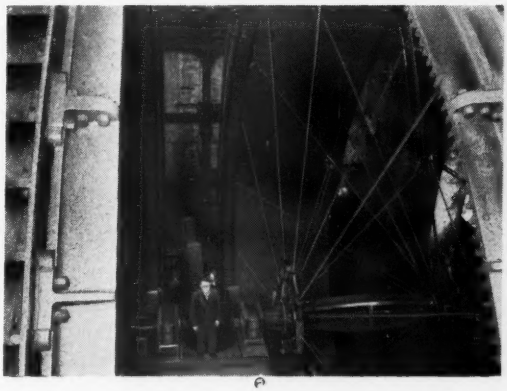
WHEN we visited the cotton works of James Finlay & Co., Ltd., at Catrine, Ayrshire, in 1945 (*Electrical Review*, 27th July, 1945), we saw the beginning of a major reconstruction scheme which is now reaching an advanced stage, although many months must still pass before it is completed. At that time one of the masterpieces of British engineering of the last century still in operation was an extraordinary twin water wheel with each section measuring 12ft wide and 50ft in diameter. The wheel was developing about 500 h.p., operating under a 50ft fall on the River Ayr, and was driving about 300 looms and 8,000 spindles.

This power had been supplemented progressively by a public supply from the former Ayrshire Electricity Board since 1932, and in 1945 the demand on the public system was about 2,000 kW. Since then the water wheel has been dismantled, but the River Ayr is to continue to serve the works with power, for a new hydro-electric power station is now under construction. This will use the original dam, waterways and reservoirs without major alterations, apart from clearing over a century's silting from the reservoirs.

The works dates back to 1786, Catrine at that time consisting only of the mill, two houses and a smithy. The inevitable result to-day is that the town is built literally round the works, but with the removal of the old works now right in the centre of the town and with all the main roads converging on it, there will be ample space for town planning. The company has owned the works since 1801 and the water wheel was commissioned in 1825.

The outstanding feature of the developments at Catrine is the new cotton works, the foundation stone of which was laid in 1945. The building proper, which now stands almost completed although only partly equipped, is still practically at the centre of the town near its parent works. There is another James Finlay works in the town which is devoted to all the cloth finishing processes, but it is generally known as the bleaching works. The River Ayr takes an "S" course through the town, and the bleaching and the cotton works are at the insides of the two bends.

The new cotton works is a direct result of a £560,000 project drawn up in 1943, for which the slogan was "Modernization with full mechanization for vertical production." It comprises new spinning mills and weaving sheds, and provision for preparation and ancillary processes all in a block of buildings occupying a ground area of about 530ft by 240ft and having a total working floor space of over 223,000 sq ft. While the weaving sheds are single-floor premises the spinning mills comprise a five-storey building designed as a whole for vertical processing. The new works will replace the old one entirely, but with completely new and up-to-date equipment, while the existing bleaching works will remain after considerable modernization and extension. It will deal with every



In 1945 this 125-year old twin water wheel, developing 500 h.p., was serving 300 looms and 8,000 spindles as a mechanical group drive

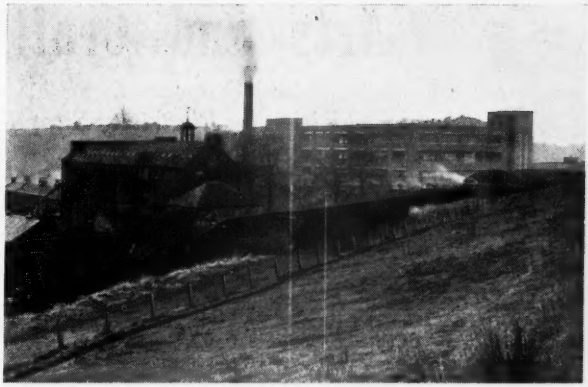
The River Ayr is to continue to be a source of power for the Catrine works, utilizing the original weir

phase in the manufacture of cloth from raw cotton, apart from finishing.

Coincident with the construction of the new cotton works and the modernization and the extension of the bleaching works a new weaving shed is being constructed at the company's works at Deanston, Perthshire, where the spinning mill will be used as a preparation mill for weaving. All the yarn required at both Deanston and Catrine will be produced in the new cotton works, and all the cloth produced at the two establishments will be dealt with in the reconstructed bleaching works. Considering the developments at Deanston and Catrine as a whole the output will be doubled and the products will include high grade sheetings, furnishing and dress materials, towels and window hollands.

An important factor in the decision to establish a hydro-electric supply is the assurance of continuity of supply as a safeguard for material being processed at any time of a value of up to £30,000. The source of supply for the new hydro-electric station will be on the up-stream or eastern end of the river's "S" course where the weir, which was originally established for the supply to the old water wheel early last century, is still in existence and will continue to serve the new hydro-electric station near the centre of the "S" where

Three 48in pipes will conduct the water from reservoirs to the three 150 kVA turbo-alternators in the new station; note River Ayr and new bridge down-stream



"Modernization with full mechanization for vertical production"; new cotton works right, old cotton works left

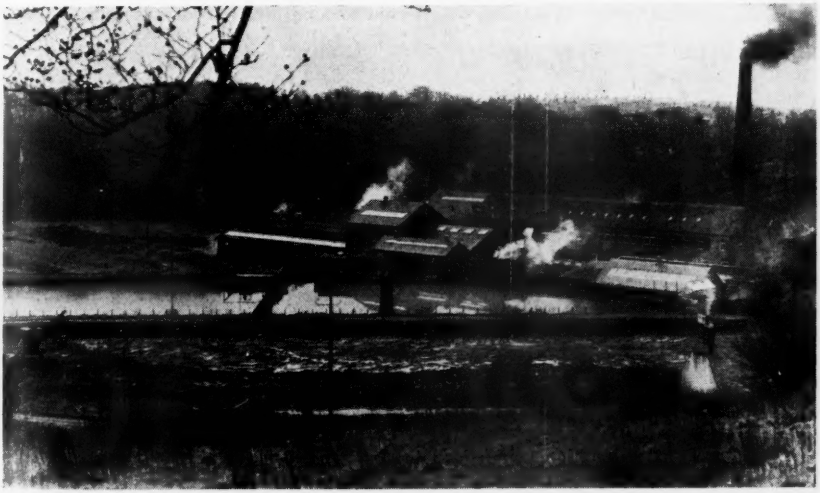
the river fall is about 2ft below the weir. The water passing over the weir runs away down-stream to Ayr Harbour, while the arrested water flows through a lade to serve a system of reservoirs which was also constructed for the old water wheel.

Three 48in pipes will conduct the water to the three 150 kVA turbo-alternators in the new station, all of which together on full load will pass 12,000 cu ft of water per minute. The Gilbert Gilkes horizontal turbines are directly coupled to Bruce Peebles alternators, and on the electrical side there will be English Electric switch and control gear. The civil engineering work is in the hands of Wilson, Kimmond & Marr and includes a new bridge over the River Ayr near the tail race.

The new hydro-electric station will generate at 11 kV and will have a direct connection to the bleaching works only—not to the cotton works or to the public supply system direct. There is already in existence an 11 kV public supply ring main exclusively serving both the bleaching works and the new cotton works. There are two service loop connections from the ring into the new cotton works.

We are indebted to Mr. Taylor for permission to visit the works and to publish this article, and to Mr. F. Grundy for help in obtaining information and illustrations.

The existing bleaching works will remain after considerable modernization and extension; note reservoirs (part dry) first for old wheel, and now for new hydro-electric station



Arts and Crafts

National Exhibition by Electricity Supply Employees

DURING 1950 local exhibitions of arts and crafts by employees in the electricity supply industry were held by the various Electricity Boards and Generating Divisions of the British Electricity Authority. From these exhibits, including all the prize-winning items, selections were made for a National Exhibition of Arts and Crafts, which was held for four days last week at the Old Horticultural Hall, Vincent Square, London, S.W.1.

The exhibition, which was sponsored by the National Joint Advisory Council for the Electricity Supply Industry, was to have been formally opened by Mr. Noel-Baker, Minister of Fuel and Power, but owing to indisposition he was unable to attend, and in the absence of Lord Citrine, chairman of the B.E.A., who is on his way home from India, the exhibition was opened jointly by Sir Henry Self, deputy chairman (administration), and Sir John Hacking, deputy chairman (operations), of the B.E.A.

In a brief address, Sir Henry said that the idea arose from an arts and crafts exhibition held in the Mersey and North Wales Area, which proved so successful that similar exhibitions were held in the areas of the other Electricity Boards and Divisions, culminating in the National Exhibition. Altogether 11,000 exhibits had been shown and 1,700 of these had been selected for the national display. The B.E.A. welcomed the organization of such exhibitions as it was always willing to encourage self-expression by members of the industry. He referred to the importance of cultivating hobbies and praised the high standard of the exhibits. He also thanked all those concerned with the organization of the display, particularly mentioning the British Electrical Development Association, which had been responsible for the layout of the exhibition. Sir John Hacking also spoke of the excellence of the exhibits and of the organization.

The opening ceremony was attended by many prominent people in the electrical industry, including chairmen and vice-chairmen of the Electricity Boards.

The display was divided into twenty-one classes and the wide range included paintings, photography, furniture and cabinet making, engineering models, toys, needlework and embroidery, weaving, leatherwork, metalwork, literature, and a children's corner. All the exhibits were of such excellent workmanship that the panel of judges must have found the selection of prize-winners in the various classes a difficult task.

Sir Henry Self (left) and Sir John Hacking looking at some of the exhibits in the toy section of the National Arts and Crafts Exhibition of the electricity supply industry, and (right) models in the engineering section

Consumer Demand

Graphical Analysis into Component Elements

By R. T. HANCOCK

THE integral of the well-known Gaussian bell-shaped curve, which represents the respective frequencies of observed values, symmetrically disposed about an arithmetic mean value, can be represented as a straight line by plotting the values observed on arithmetic probability paper against their cumulative percentage frequencies. The mean, or average, value of the observations is then indicated by the point at which the 50 per cent ordinate cuts the straight line. The standard deviation is half the sum of the values read where the 16 and 84 per cent ordinates cut the straight line, or, what comes to the same thing, is the difference between either of these readings and that at 50 per cent.

Logarithmic Probability Paper

Often the distribution of the observed frequencies does not conform to this symmetrical arrangement, but forms a skew curve rising rapidly to its mode (highest point) and then decreasing more slowly as the observed values increase. In very many such cases, plotting the logarithm of the observed values instead of the values themselves on arithmetic probability paper, against their cumulative percentage frequencies, will form a straight line. To avoid the need for looking out logarithms, logarithmic probability paper is available on which the scale of the observed values is a logarithmic one, just as are the scales on a slide-rule, instead of an arithmetic one.

The value now read where the 50 per cent ordinate cuts the straight line is the geometric mean, not the arithmetic mean. The former is the true mean with such a distribution of frequencies. The standard deviation is now the difference between the logarithm of the value read at either the 16 or 84 per cent ordinate and the logarithm of the value read where the 50 per cent ordinate cuts the straight line. The standard deviation is thus a logarithm itself and should be kept in this form rather than be reduced to its numerical value.

Whether to use arithmetic probability paper (A.P.P.) or logarithmic probability paper (L.P.P.) depends on which will give a straight line with the data under examination. It is generally easy to see whether these would give a normal Gaussian curve or a skew curve. Points plotted on A.P.P. should properly have been used to define a curve which is concave upward instead of a straight line. When the standard deviation is small it makes little difference which is used, but when there is an alternative it is better to use L.P.P. Cases of this kind arise when the spread of the observed values is a small one.

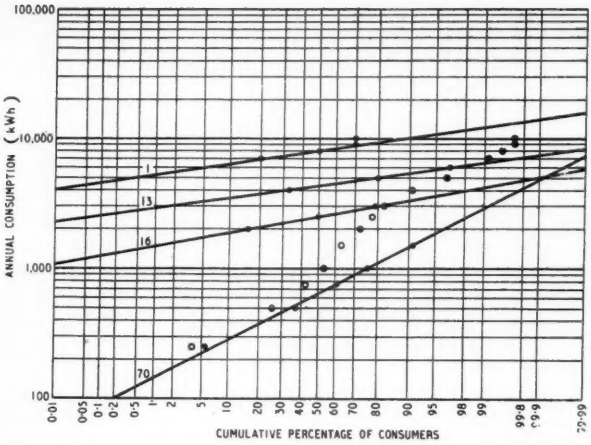
The straight line in either case represents a single "population" with its own particular characteristics, but cases arise in which the data relate to two or more populations occurring together. The effect of plotting them is then to form a sigmoidal (flattened S-shaped) curve where two populations are concerned, with a point of inflexion where one part of the curve merges into the other. With three populations there will be two points of inflexion, and so on. With more than three or four it is often impossible to distinguish the points of inflexion. In certain cases such a curve may even closely resemble a straight line.

Analytical Method

Realizing that these sigmoidal (sinusoidal) curves indicate the simultaneous existence of more than one population in the data concerned, mathematicians have long sought for a means of analysing them into components, but the task has proved beyond their powers. Quite recently, however, Dr. J. P. Harding, of the British Museum of Natural History, has published a graphical method* that is applicable to the simpler cases in which not too many populations are concerned. He does not claim to have discovered it, but it does not appear to have been published previously and deserves a wider publicity.

As an instance of the application of this

* *Journal*, Marine Biological Assoc. of the U.K., Vol XXVIII, May, 1949, pp. 141–153.



method of analysis, with a simplification in procedure which I have found it possible to use, the data of Table 3 in report K/T 127 of the Electrical Research Association can be taken. The title of the report is "Investigation of a Sample of Domestic Two-Part Tariff Consumers" and that table shows the "Cumulative Distribution of Annual Consumption." It is here reproduced in an expanded form:

TABLE I.—Expanded from the original (Table 3) in E.R.A. report K/T 127.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
250	3·8	5·42						
500	25·8	36·8						
750	42·2	60·2						
1000	53·2	76·0						
1500	63·5	90·7						
2000	72·5		2·5	15·6				
2500	78·0		8·0	50·0				
3000	82·7		12·7	79·3				
4000	90·3		20·3		4·3	33·1		
5000	96·4		26·4		10·4	80·0		
6000	98·6		28·6		12·6	96·7		
7000	99·2		29·2		13·2		0·2	20·0
8000	99·5		29·5		13·5		0·5	50·0
9000	99·7		29·7		13·7		0·7	70·0
10000	99·7		29·7		13·7		0·7	70·0

(1) Annual consumption in kWh. (2) Cumulative percentage of consumers. (3) Col. (2) divided by 0·70. (4) Col. (2) minus 70. (5) Col. (4) divided by 0·16. (6) Col. (4) minus 16. (7) Col. (6) divided by 0·13. (8) Col. (6) minus 13. (9) Col. (8) divided by 0·01. Figures in Cols. (2), (3), (5), (7) and (9) are plotted against the corresponding figures in Col. (1) on log probability paper.

The chief difficulty with this method of analysis lies in selecting the respective proportions of the populations with which the data deal as a whole. Inflexion points on the sinusoidal curve may provide a rough guide, but successive trials and approximations will be needed before satisfactory figures are obtained. Charts on cartridge paper should be used, as there will be a good deal of erasure during these trials. As the slide-rule is quite sufficient for the calculations involved, these, while time consuming, present no real difficulty.

Finality is reached when the translated points fall satisfactorily upon a straight line. If the population figure tried is too small, it will produce a curve which is concave upward and *vice versa*. If the best attempt to produce a straight line yields one that still shows traces of a sigmoidal form, it is probable that two populations are involved which are being handled as one. This is most often the case with the lowest value group. As long as the sum is correct, although it may have been ascribed to one population whereas two are involved, the analysis of subsequent groups is not affected. Aberrant values among the data are the cause of much trouble. As experience in the use of the method is gained most of these difficulties will disappear.

When a satisfactory analysis into constituent populations has been attained, the usual statistical procedure may be followed of drawing the curves, normal or skew, which each straight line represents. In cases in which the curves are skew and L.P.P. has been used, it will simplify matters a little if they are calculated (from published tables) as normal Gaussian curves and plotted upon a logarithmic base. I admit that I have never carried an analysis to this length, but a statistician may wish to do so.

The manner in which Table I is reproduced here makes further explanation of the method unnecessary. The points resulting from plotting Col. 2 against Col. 1 indicate a sinusoidal curve with an inflexion somewhere between 65 and 75 per cent. Trial and error yields 70 as the value which best results in a straight line; 70 is then deducted from Col. 2, giving Col. 4, and again by trial and error 16 is found to be the most likely percentage of the second population. The last line, the 1 per cent

population, does not admit of a very good fix, but as it represents so small a proportion of the whole and is based on few cases this is to be expected and the error it may introduce is negligible.

When straight lines have been drawn through the translated points in the positions it has been decided they should occupy, the geometric mean and the standard deviation for each population can most conveniently be determined by setting down the numerical values of the intersections of its line with the ordinates at 84 and 16 per cent, with their logarithms, leaving a space between them for subsequent insertion of the value at the intersection with the 50 per cent ordinate, this being the geometric mean. The calculation for 70 per cent may be tabled as:

@ 84: 1210	=3·08278
@ 50: 639·5	=2·80585
@ 16: 338	=2·52892
	0·55386
	s=0·27693

The difference between the logs at 84 and 16 is halved and is the standard deviation s, expressed as a logarithm and best kept in that form. Adding it to the log at 16, or deducting it from the log at 84, gives the log at 50 per cent. Its anti-log should agree with the value at this intersection read on the graph.

The figures for kWh in the original full table naturally possess an arithmetic mean, whereas geometric means are obtained by the use of L.P.P. The one may be converted into the other by the equation:

Log geometric mean $+1{\cdot}1513(s)^2$=log arithmetic mean, where s (the standard deviation) is in logarithmic form. Conversion to the arithmetic mean may be tabled as follows:

s	=0·27693=$\bar{1}$·44237
	2
	2·88474
1·1513	0·06118
	0·08829=2·94592
639·5	=2·80585=geometric mean
	2·89414
0·7	=$\bar{1}$·84510
548·58	=2·73924=weighted arithmetic mean

The calculations for the 16, 13 and 1 per cent populations are carried out in the same way, the arithmetic means after weighting by their proportions being 548·6, 412·2, 572·0 and 81·5, the sum of which (the arithmetic mean of the whole) is 1614·3. It is understood that the officially adopted mean is 1600.' There should always be a close agreement between the arithmetic mean obtained in this way and that found by the customary method of calculation. Exact agreement is not to be expected, as one method uses the original data figures and the other the figures which have been smoothed down by the normalization process, but by a graphical method which lacks exactness.

The calculated readings at the 50 per cent ordinate for each population are 639·5, 2516·6, 4326·6 and 8053·6. Multiplying them by their respective proportions gives 447·7, 402·7, 562·5 and 80·5, which sum to 1493·4. Dividing each figure by 1493·4 gives the percentage of the kWh taken by each of the constituent populations, the figures being:

Percentage of consumers	Percentage of kWh
70	30·0
16	27·0
13	37·6
1	5·4

The figure 1493·4 is the geometric mean demand in kWh per annum, as the fact that L.P.P. was required to make the analysis shows that the curves are skew and not normal Gaussian curves, although only the 70 per cent population shows this very markedly.

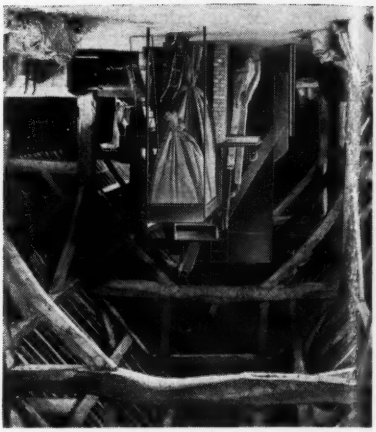
But it is difficult to get engineers to agree that in such cases the geometric mean is the true mean. Here arithmetic mean provides a safety factor of about 100 kWh, but there are cases (e.g., mine sampling) in which the arithmetic mean is 50 per cent in excess of the truth, a serious affair for investors.

Ultrasonics

A SPECIAL course of four lectures on ultrasonics is to be given on Friday evenings at the Polytechnic, Regent Street, London, W.1, by Mr. L. J. Farran (G.E.C.), commencing 2nd March. The subject matter will cover fundamentals, the generation and reception of ultrasonic waves and industrial applications. The lectures will be presented in a manner easily understandable to those of average scientific attainment and the impact of recent research on manufacturing processes will also receive adequate attention. Enrolment forms may be obtained on application to the Head of the Electrical Engineering Department, and should be completed before the date of the first lecture. The fee for the course is 10s.

Farming To-day—II

Modern Electrical Means of Increasing Productivity

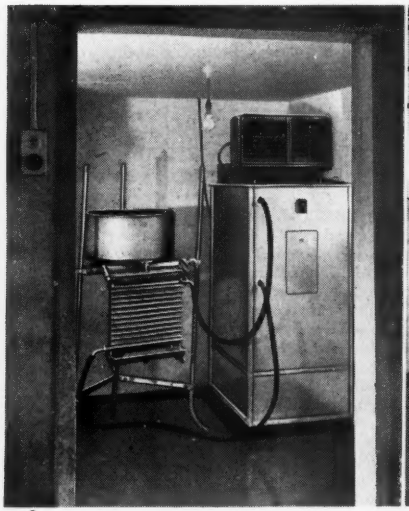


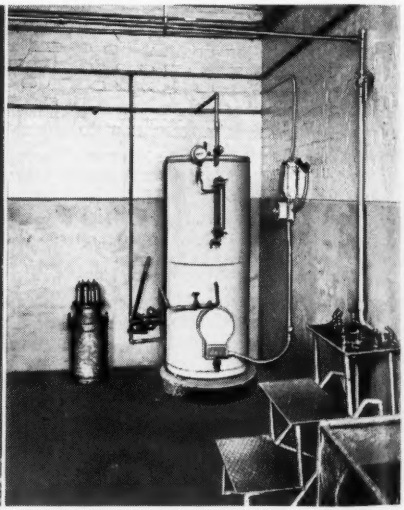
This Mather & Platt grain dryer at Manor Farm, Burghclere, is to be converted to electricity

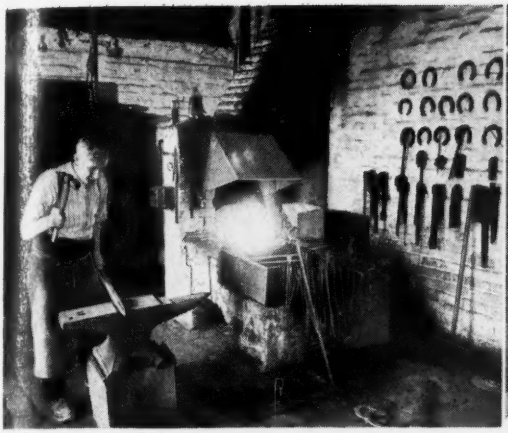
CONTINUING our tour of farms in the Newbury Sub-Area of the Southern Electricity Board, we next visited three farms belonging to Mr. H. A. Benyon, the Lord Lieutenant of Berkshire, at Englefield, near Theale. It is perhaps the sterilizing arrangements which provide the most interesting aspects of the installations in these establishments. In each case G.E.C. 6 kW storage steam raisers are employed in conjunction with a Bamford chest to deal with the Alfa Laval 3-unit combined milking and recording equipment required for a herd of 30–40 cows. Incidentally, it is found that the adoption of electricity reduces the time taken for milking a cow from 7 min to 4–4½ min.

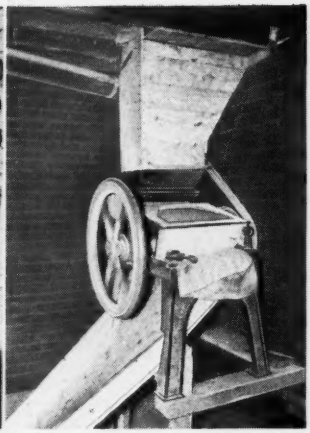
Condensation is always a potential source of trouble in the dairy. How the lighting

Left: **"Loheat" chilled water cooler at Kiln Farm, Kintbury.** *Right:* **G.E.C. 6 kW storage steam raiser at Mayridge Farm, Englefield**







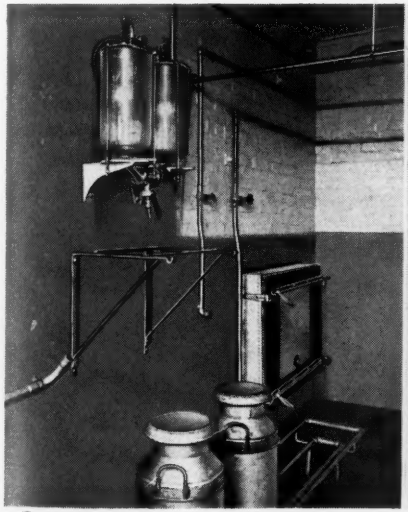


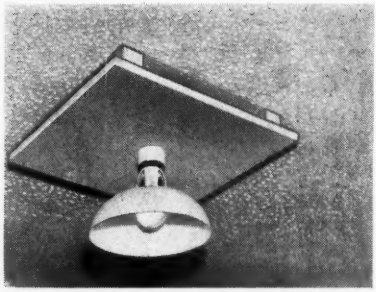
Left: **A blacksmith's shop is almost a necessity on the modern farm. This one at Mayridge Farm, Englefield has an electrically operated forge.** *Right:* **Machine for rolling oats at Mayridge Farm, Englefield**

fittings and wiring can be protected from it is to be seen at Chalk Pit Farm where circulation of air round the fittings has been secured by mounting them on baffle boards a few inches from the ceiling.

With the increasing use of farm machinery an engineer's workshop and a blacksmith's shop are almost necessities on the modern farm. The way in which a forge can be adapted to electric blowing is demonstrated at Mayridge Farm. The ½ h.p. motor driving the blower can be run at any one of eight speeds to give exactly the conditions required and the forge can be put into

Left: **Bamford sterilizing chest at Mayridge Farm, Englefield.** *Right:* **Direct expansion cooler with "Prestcold" refrigeration unit at Oakwood Farm, Benham**





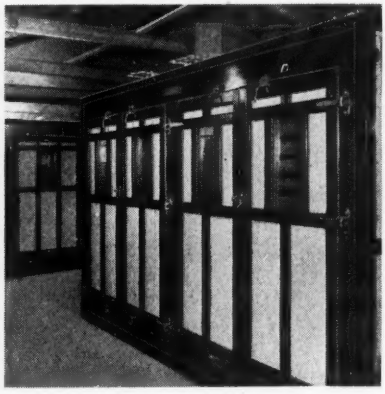
Lighting fittings at Chalk Pit Farm, Englefield, protected from condensation by mounting on a baffle board a few inches from the ceiling

operation within a few moments of starting up.

At the same farm a Kennedy & Kempe 2 ton an hour grain dryer has been installed. This incorporates an oil burning furnace operated by a 1 h.p. motor, and a fan with a 20 h.p. motor. A cleaner (2 h.p. motor) is provided and a 15 h.p. motor drives a pneumatic conveyor for taking the grain to and from the storage hoppers. Centrifugal clutch pulleys are fitted on the drives of the larger motors. All the motors are single-phase machines of Brook manufacture.

The feeding of rolled oats to stock is found to be very beneficial to milk yield. A machine for preparing the grain is driven through shafting from a 10 h.p. motor which in addition drives a cake breaker and other farm machinery. A centrifugal pump has also been installed. The consumption of electricity at this farm during the twelve months ended 24th February, 1950, was 28,928 kWh. At Chalk Pit Farm, where there is a connected load of about 8 kW, 13,013 kWh was used between 15th July, 1949, and 22nd February, 1950, while at the third farm, Mile House Farm (8 kW load), the consumption was 7,148 kWh in the quarter ended 16th November, 1950.

Stephens 26,000-egg incubator with separate hatching compartment at Beachwood Poultry Farm, Hampstead Norris



For a consumption of 8,790 kWh, electricity has assisted Mr. W. H. Jagger of Oakwood Farm, Beenham, in attending to his herd of 20–25 Jerseys. He employs a Gascoigne bucket milker, a direct expansion cooler with " Prestcold " refrigeration unit, a G.E.C. sterilizer and a 5 h.p. motor driving alternatively a Bamford combined roller and crusher mill, a pulper and chaff cutter or a circular saw.

A Ransomes, Sims & Jefferies universal crop dryer has just been installed on the 2,000 acre Ashbrook Farm of Churn Estates, Ltd., at Blewbury. In a new building two units are now in use, each capable of dealing hourly with about 4 tons of grain or 5 cwt of grass. They are oil fired and each incorporates a 20 h.p. motor driving the dryer and a 5 h.p. motor for the conveyor which carries the grain or grass from dryer to storage bins. One of the machines is fitted with a photo-electric cell device to regulate the feed.

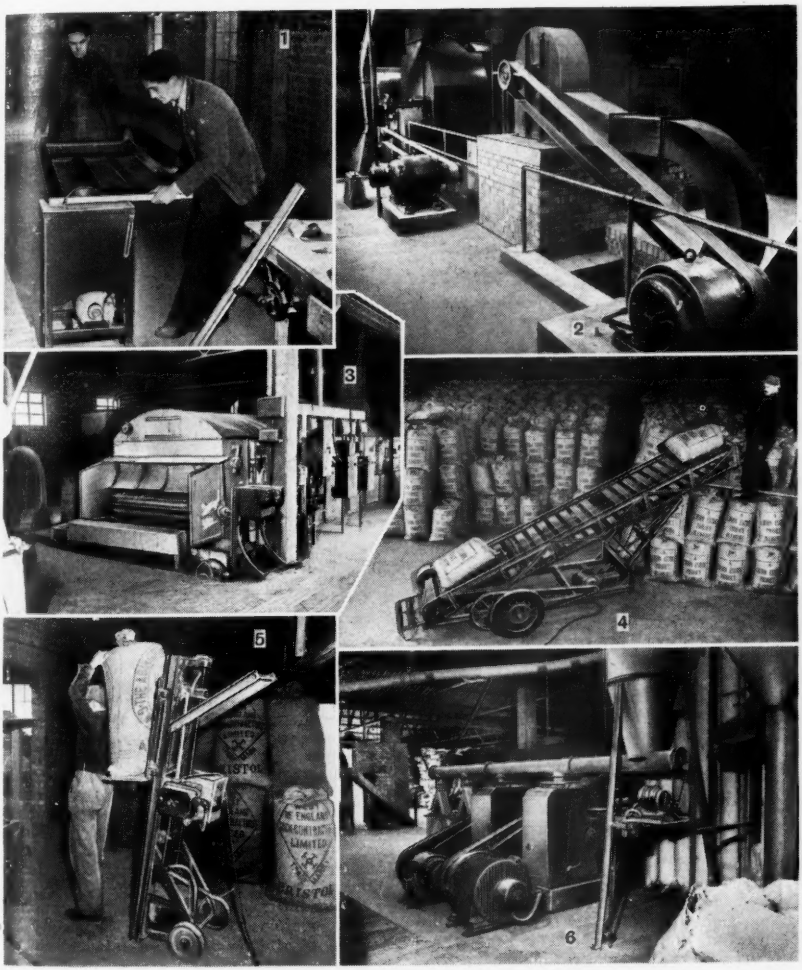
Dried grass is blown by a pneumatic conveyor to a pre-breaker and a Briton mill (driven by a 70 h.p. motor), a worm conveyor then feeding it to cubing machines (30 h.p. motors) where it is compressed into pellets. For handling the grain, horizontal and vertical bucket type elevators are preferred to the pneumatic kind since they do not cause dust. Cleaning is done by means of a Eureka separator and facilities are provided for dressing the grain required for seed. Handling of the filled sacks is facilitated by the use of portable sack lifters and loaders. For this extensive installation, which handles approximately 1,000 tons of grain and grass a year, the total load is about 267 kW, and the consumption last year was 61,282 kWh. The farm is fully equipped to undertake repair and maintenance work and the equipment includes a neat circular saw.

To see how another class of farmer is catered for we next went to Hampstead

Norris where Mr. E. R. Rice has established at Beachwood Poultry Farm a business in day-old chicks. He has a Stephens 26,000-egg incubator with separate hatching unit. His electrical equipment also includes a submersible pump. The total load of the equipment is about 5 kW, and the consumption of electricity during the twelve months ended 8th February, 1950, amounted to 12,221 kWh.

A later version of the "Loheat" chilled water milk cooler than that referred to at

(1) A circular saw is found of great value at Churn Estate, Blewbury; (2) Kennedy & Kempe 2 ton an hour grain dryer at Mayridge Farm, Englefield; (3) One of the two Ransomes, Sims & Jefferies universal crop dryers; (4) mobile sack conveyor; (5) portable sack lifter and (6) dried grass cubing machines, all at Churn Estate



Court Farm was installed at Messrs. L. & E. Bevan's Kiln Farm, Kintbury, last July. Like the other unit it has a capacity of 100 gall of milk a day and is used in conjunction with a "Prestcold" refrigeration unit. Other apparatus in use on this farm, bringing the demand up to nearly 12 kW, includes a Gascoigne milker, a G.E.C. self-contained sterilizing chest (6 kW), a wash-boiler to provide hot water, and a bottle washer. The electricity consumption for the twelve months ended 28th February, 1950, was 15,029 kWh.

At the last farm we visited, Mr. C. F. Gent's Manor Farm, Burghclere, was an example of another type of grain dryer, a Mather & Platt 1 ton an hour plant. At present it is heated by hot air from a solid fuel furnace but its conversion to electricity is to be undertaken shortly. It has a 6 h.p. motor to drive the fan and is used in conjunction with a Eureka cleaner. This farm also boasts a well-equipped workshop. Altogether the apparatus requires about 10 kW. Between 23rd July last when the farm was connected and 16th November, 1,251 kWh was consumed.

Our thanks are due to all the farmers concerned for facilities granted us to inspect their equipment. We are grateful too to Mr. H. R. J. Baigent, Southern Electricity Board agricultural development officer, Mr. A. F. Hardcastle, Sub-Area commercial officer, Mr. S. T. Harman, agricultural adviser, and other members of the Southern Electricity Board's staff for their assistance in preparing this and the previous article.

SOUTH AFRICAN NEWS

From Our Cape Town Correspondent

TO safeguard consumers against paying too much for electricity because their meters are faulty, the South African Bureau of Standards has worked out tests for electricity meters. In a statement the Bureau says: "Electricity to the value of many thousands of pounds is sold to consumers every month and is measured by means of meters on which there is no compulsory check, whereas, the ordinary shopkeeper is required by law to have his weighing scales regularly assized by Government inspectors." The new code of practice recommends a margin of error in registration in a meter limited to 2½ per cent and adjustment every six years to see that this standard is maintained.

Work has been started on the concrete foundations for the boilerhouse of the Electricity Supply Commission's new Vierfontein power station, midway between Klerksdorp and Bothaville. The first 30,000 kW generator is expected to be brought into commission in June, 1952, and six other generators at six-monthly intervals, bringing the total initial capacity to 210,000 kW. Preliminary work has also been started at the Vierfontein colliery, which will supply the boilers of the power station with crushed coal by a direct conveyor belt. This new power plant is to supply the new mines of the Far West Rand and the Orange Free State goldfields. The new station planned for Taaibos will also supply the latter area.

An increasing range of electric refrigerators is being made or assembled in South Africa and this development is likely to become more pronounced. Towards the end of 1950 the South African Electrolux Company in Johannesburg went into production on the LT700 model, for which the refrigeration unit is still imported. It is expected that when the present supply of imported units has been used up, the cooling system as well as the cabinet will be made in the South African factory.

Manufacturers of electric cables report that adequate supplies of copper, as well as steel, are becoming difficult to obtain. Shortages have not as yet affected production but they may in the future cause a reduction in output. There is at present a growing overseas market for locally manufactured electric cables and its expansion might be hindered by such shortages and also by restrictions on the export of copper products from the Union.

The 1,000,000 V industrial X-ray unit installed in the workshops of the Vanderbijl Engineering Corporation, Ltd., is the largest radiographic unit for industrial use at present in service anywhere in Africa. The special laboratory is being used principally to detect flaws in light and heavy castings.

The Electricity Supply Commission of Southern Rhodesia has made it clear that large consumers of electricity must give the longest possible notice of their requirements. So far the Commission has been able to plan ahead for all demands. In a few areas non-completion of plant contracts placed well ahead of estimated requirements has meant that consumers have had to stagger their loads. Congestion at the port of Beira and on the railways also meant delay in the commissioning of new equipment. The greatest difficulty has been experienced in getting material in the order required for erection.

VIEWS on the NEWS

By REFLECTOR

ALL the Electricity Boards have connected to their systems large numbers of hired appliances, relics of the days, now past, when to compete with the gas concerns and build up load many undertakings instituted simple hire schemes at attractive rates. Although it is possible that many of these appliances were written off long ago, thousands still remain. By to-day's standards the charges are ridiculously low and maintenance charges continue to rise. Consequently several of the Boards are trying to disembarrass themselves of the burden by offering the appliances to the consumers who have hired them, at extremely low prices. I have had reports of cookers, priced to-day at £30, being offered at little over a pound. Some of the smaller appliances are being given away. This is not a new idea; I recall that some undertakings, including the former London J.E.A., followed the same practice some time before nationalization.

* * *

I have already referred to the fine distinctions which the Ministry of Fuel and Power has to make in administering the Advertisement Lighting (Prohibition) Order. The E.C.A. recently asked whether illuminated indoor direction signs were forbidden and was told by the Ministry that:—

> "If lighting fittings are used as signs to assist persons who are already on premises for the purpose of doing business with the occupier, it may well be that the use is part of the efficient management of the business, and is not for the purpose of advertisement. On the other hand, if they are used to attract persons who are not already on the premises, it would appear that this use is for the purpose of advertisement."

* * *

Desirable (and necessary) as it is that rural electrification should pay for itself I do not favour any sort of compulsion. Nor do a number of members of the Manx House of Keys. One of the clauses in the recently introduced Agricultural Holdings and Dwellings Bill gave the Board of Agriculture power to compel landlords to provide supplies of water and electricity to farmhouses where this could be done at reasonable expense. Members of the House objected both to the principle and to the lack of definition of "reasonable." Eventually an amendment was carried providing that the Board could make an order only when application was made by a tenant. One member described the Bill as "nothing else but Communism." Another put forward the strange doctrine that if people did not take advantage of the facilities offered they should be compelled to do so. This opens up very wide possibilities.

* * *

Scenic beauties are not the only barrier to electrical transmission lines. It is the aim of the Cumberland County Council to preserve the wild moorland as it was in Roman times, according to a correspondent of *The Times*, and it consequently objects to a B.E.A. proposal to erect a line from Newcastle to Glasgow *via* the gap through the Pennines to Carlisle. The route would cross Hadrian's Wall at some points. Although the B.E.A. is considering a proposed alternative route, I can imagine disgruntled transmission engineers regarding the Wall and agreeing with Shakespeare's Antony that the evil men do lives after them.

* * *

Some local authorities are prone to raise objections to overhead lines without being very considerate of the extra cost entailed by the use of underground cables. I see that the financial aspect has been brought home forcibly to a Council in the north-east which requested that certain cables on a housing estate should be laid underground. It was intimated to the Council that the cost might work out at £40,000. What contribution would it make? The reaction may be gathered from a remark by one of the councillors that the figure was "outrageous."

PERSONAL and SOCIAL

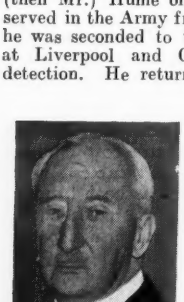
News of Men and Women of the Industry

IT is reported that **Mr. J. Newton,** station superintendent, Bradford generating station, has been appointed to succeed **Mr. E. F. Hall** as station superintendent, Brimsdown. Mr. Hall is shortly retiring after forty-one years' service with the Northmet Power Co. and the Eastern Division of the British Electricity Authority.

Mr. J. C. M. Foxcroft has completed twenty-five years' service with Ashley Accessories, Ltd., Ulverston, Lancs. He joined the company at their works, which were then in Liverpool, as works manager. Mr. Foxcroft, who is now works director, was recently presented with a grandmother clock in appreciation of his services. Mr. E. T. White, managing director, who was accompanied by Mrs. White, made the presentation at the company's annual dance.

General Sir Hubert de la Poer Gough has been appointed chairman of Siemens Bros. & Co., Ltd., in succession to the late Dr. H. R. Wright. The **Earl of Gowrie** has been appointed vice-chairman and **Mr. F. A. Lawson** has been appointed managing director.

Mr. Lawson graduated at the University of Liverpool and, after spending some time at the Karlsruhe Technical University, entered the alternating current section of Siemens Brothers Dynamo Works, Stafford, in 1909. He was transferred in 1911 to the Caxton House staff, working under the late Sir George (then Mr.) Hume on the patents side. He served in the Army from 1914 until 1917 when he was seconded to the Admiralty for work at Liverpool and Greenock on submarine detection. He returned to Siemens in 1919 and in later years became concerned with the executive side of the company's business, joining the boards of various subsidiary companies. He is a director of Caxton Electric Developments, Ltd., Siemens Electric Lamps & Supplies, Ltd., and Alfred Graham & Co., Ltd. He is also a director of the Siemens and General Electric Railway Signal Co., Ltd., jointly owned with the General Electric Co., Ltd., and chairman of Submarine Cables, Ltd., jointly owned by Siemens and the Telegraph Construction & Maintenance Co., Ltd. He joined the board of Siemens Brothers & Co., Ltd., in 1946.



General Sir Hubert Gough

Mr. F. A. Lawson

Mr. J. O. Twinberrow, who until recently held the position of publicity manager with Babcock & Wilcox, Ltd., was entertained to lunch at the Connaught Rooms, London, on 6th February by the members of the Publicity Committee of the British Electrical and Allied Manufacturers' Association. He had been a member of that Committee from 1945 until his retirement at the end of last year, and was its chairman in 1945-46. After the lunch the chairman (Mr. D. G. Denoon) on behalf of the Committee presented Mr. Twinberrow with a pair of field glasses as a memento of his long and happy association with them.

Mr. F. A. Ellis, M.I.E.E., M.I.Mech.E., at present manager of the Yorkshire Electricity Board's No. 2 Sub-Area, has been appointed manager (designate) of the No. 2 (Newbury) Sub-Area of the Southern Electricity Board as from 1st July next. Upon the retirement of the present manager, Col. H. G. Fraser, on 1st January next, Mr. Ellis will assume the full responsibility of the post. Mr. Ellis was borough electrical engineer of Huddersfield before joining the Yorkshire Board's service in 1948. Earlier he was a member of Arthur Ellis & Partners and with the Yorkshire Electric Power Co.

Mr. W. M. Lydall, chairman and managing director of the Yorkshire Electric Transformer Co., Ltd., a racing member of Windermere Motor Boat Racing Club, has been appointed vice-commodore.

On 3rd February the apprentices of the Witton Works of the **General Electric Co., Ltd.,** held their annual dinner, over 400 apprentices and guests attending. Replying to the toast of the company, proposed by Mr. P. A. B. Wooldridge, chairman of the Apprentices' Association, Sir Harry Railing

(chairman of the G.E.C.) said that opportunities for the young engineer to-day were never better. The toast of the Association was proposed by Mr. J. J. Gracie, C.B.E., general manager, Witton Engineering Works, and that of the guests, to which Mr. W. K. Brasher replied, was proposed by Mr. P. L. Cowie. This was followed by the presentation of

Sir Harry Railing presenting the Apprentices' Cup to Mr. C. I. Sym-Smith, hon. secretary of the Apprentices' Association

awards by Sir Harry Railing. The evening closed with entertainment provided by the apprentices themselves.

Mr. E. Bellingham, O.B.E., LL.B., lately administrative officer to the Hemel Hempstead Development Corporation and previously town clerk of Stockton-on-Tees, has now joined the Coal Utilization Joint Council as its director general.

The 17th annual dinner of the East Kent Branch of the **Electrical Contractors' Association** was held at Canterbury on 8th February. About 150 attended under the chairmanship of Mr. A. Apps and the guest of honour was Mr. P. G. Wallis, national president of the E.C.A. Proposing "The E.C.A. and Allied Associations," Mr. W. J. Bird (sales manager G.E.C.) expressed the opinion that the B.E.A. was sincere in what it set out to do in co-operation with the electrical contractors. He firmly believed, however, that an individual business, founded on individual skill and encouragement, would always have its functions in the world. Mr. P. G. Wallis responded.

Dr. T. E. Allibone, who is in charge of the A.E.I. fundamental research laboratory, Aldermaston, Berks, left London on 18th February on a visit to Greece and Turkey for the British Council, where he is to lecture on atomic energy and its industrial possibilities. The main purpose of the tour is for Dr. Allibone to meet scientists, engineers and students, but he will also give public lectures.

Mr. K. H. Williman has been appointed radio sales manager of E. K. Cole, Ltd., and will take up his duties at Southend on 1st March.

To mark the "coming of age" of the **J. L. Eve Construction Co., Ltd.,** twenty-three members of the staff who were first engaged in 1930 presented to the company a suitably engraved clock at the annual dinner on 9th February. The clock was handed to Mr. J. L. Eve by Mr. T. O'Leary, the oldest member of the staff.

The **Siemens Players** (Siemens Bros. & Co., Ltd.), for their second play of the winter season chose "On Monday Next," immediately it finished its professional run at the Comedy Theatre. Successful performances were given at the Sports Club Hall at Charlton on 20th and 27th January, further performances being given at the Pirelli-General Sports and Social Club, Southampton, and the Royal Herbert Hospital, Shooters Hill.

F. D. Newcombe & Co., Ltd., Exeter, held their staff party and dance at the Peamore House Hotel on 13th February. Messrs. H. S. Seccombe and A. T. Haywood, directors of the parent company (Electrical Components, Ltd.) were among those present. About seventy-five of the staff attended, including representatives from branches at Bournemouth, Plymouth and Bridgwater. During the evening a presentation of a gold cigarette case was made by Mr. G. S. Mogridge, a director of the company, to Mr. Newcombe. Mr. H. S. Seccombe in proposing a toast to Mr. Newcombe recalled some of his activities over the past 25 years. He wished Mr. Mogridge every success in his new responsibilities as general manager to which position he had recently been appointed.

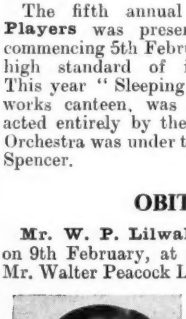
The annual presentation concert of the **Telcon Social and Athletic Club** was held on 14th February, in the works canteen of the Telegraph Construction & Maintenance Co., Ltd., Greenwich. The Telcon Concert Party gave the variety concert after which Dr. G. A. V. Sowter, chairman of the club's general purposes committee, read a message of good wishes from Mr. J. N. Dean, managing director, who was unavoidably absent. The Mayoress of Greenwich, who was accompanied by the Mayor, Councillor H. W. Gorman, J.P., presented trophies to the winners of indoor and outdoor games. Dr. E. W. Smith, director of Submarine Cables, Ltd., presented the winner of the golf challenge cup with two golf clubs on behalf

of Mr. Dean. Mr. W. F. Randall, director, then presented long-service certificates to twenty-four employees who had completed fifteen years' service with the company, and Westminster chiming clocks and certificates to five with twenty-five years' service.

The fifth annual pantomime of **Ekco Players** was presented during the week commencing 5th February and maintained the high standard of its previous successes. This year "Sleeping Beauty," staged in the works canteen, was written, produced and acted entirely by the players. The Theatre Orchestra was under the direction of Mr. R. K. Spencer.

OBITUARY

Mr. W. P. Lilwall.—The death occurred on 9th February, at the age of sixty-five, of Mr. Walter Peacock Lilwall, A.M.I.E.E., who was president of the Incorporated Municipal Electrical Association for 1944-45. Mr. Lilwall was educated at Manchester Technical School and received his training with the British Westinghouse Co. and at the Longford power station of the Stretford U.D.C. After occupying positions with the Warwick & Leamington Traction & Power Co. and the Scottish Central Power Co., he became chief assistant at Kettering. In 1919 he was appointed electrical engineer and manager of the Fleetwood undertaking and retired from that position in 1947. Upon his retirement he was elected an honorary member of the I.M.E.A.



The late Mr. W. P. Lilwall

Mr. G. E. Mason, A.M.I.E.E., who died at Colwyn Bay recently, was the first apprentice of the Lancashire Dynamo & Motor Co. (now Lancashire Dynamo & Crypto). He joined the company in 1899, and after serving in the technical office and on the outworks staff, went to Canada and a year or two later became president of the newly formed Lancashire Dynamo & Motor Co. of Canada, Ltd. Returning to England in 1916 Mr. Mason became a director of the home company and in 1933 moved to Leeds as director in charge of the North, East and Midland offices. He retired at the end of 1945.

Mr. H. J. Carter, who died on 12th February, was managing director of the Carter Electrical Co., Ltd., of Romford. He commenced in the business in 1915, which was then carried on at Stratford by his father, the late Mr. G. H. Carter, who founded the business in 1911, and his brother, the late Mr. L. G. Carter, under the name of G. H. Carter & Sons. In 1935 the business was moved to Romford and a limited company was formed with Mr. L. G. Carter as the first managing director of the company. Mr. H. J. Carter took over the managing directorship on the death of his brother in 1945. During the last war the business was almost exclusively engaged in the manufacture of special equipment. Mr. Carter and his brother were instrumental in conjunction with Ministry technicians in the design and development of several products for the Ministry of Aircraft Production and for the Admiralty.

Mr. R. C. Stanley.—The death occurred on 12th February of Mr. Robert Crooks Stanley, chairman of the International Nickel Co. of Canada, Ltd. Mr. Stanley had been associated with the company since its formation in 1901 and was president from 1922 to 1949.

Underground Gasification

AT a conference on Tuesday, following a question in the House of Commons, Mr. Philip Noel-Baker, Minister of Fuel and Power, with Dr. Roxbee Cox, chief scientific adviser, and Mr. C. Masterman, who is conducting the experiments, indicated the progress being made with exploratory trials of the gasification of coal underground at Newman Spinney, near Chesterfield.

The first trial borehole system was ignited in July, 1950, and has been producing gas ever since and, although the quality deteriorated, the information obtained has induced the Ministry to undertake more extensive trials in active association with the National Coal Board.

The first system is still operating; over 200 tons of coal in a seam which is unsuitable for mining has been gasified and about 35 million cu ft of gas has been produced of an average calorific value of 50 B.Th.U/cu ft, compared with an average of 450 B.Th.U. for ordinary town gas. A second similar, but larger, system has been prepared for gasification this year under closer control than the first.

In addition, compressed air has been applied through boreholes reaching to just below the top of the coal. The pressure has slightly lifted the overlaying strata and allowed air to pass through the coal between boreholes 33ft apart and, after ignition, the air was maintained until a channel had been burned through to avoid horizontal drilling. Gasification has proceeded in this way for two months and over 30 tons of coal has been gasified. It is hoped that this method may facilitate the preparation of new systems and the expansion of older ones as the gas quality deteriorates. So far £50,000 has been spent on the experiments.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electrical Contracting

AS a member of the staff of an Electricity Board and closely associated with both the contracting and installation testing departments I feel I must protest on behalf of my associates at the implication made in Mr. Taunton's article No. 25 in your issue of 9th February.

Talking of the application of the Code, to the principle of which all in the industry will rally in support, Mr. Taunton says:—"The supply authorities? That would be to allow them to pass their own work or condemn that of contractors who might be competing with them in their areas."

I would like to point out to Mr. Taunton that both before and since vesting day it has been left to the supply authority to test contractors' installations as well as their own departments' work and I have yet to hear of a complaint from any contractor that there has been any favour shown to the installation departments of the Boards. In fact, instructions have been given to our installation inspectors that the reverse must be the case for the specific purpose of preventing such assertions as Mr. Taunton has made.

D.C.E.

I HAVE been reading, with interest, Mr. H. R. Taunton's articles in the *Electrical Review* but to deal with all his points would be out of the question and therefore I would only state that many inconsistencies have appeared.

In article No. 25 Mr. Taunton humorously refers to socket outlets and to flexibles trailing all over the place, indicating of course that these flexibles have no protection other than ordinary insulation. Flexibles, I will admit, are a bit of a nuisance to contractors and users alike but until we find some means of protection or elimination, we shall have to put up with them.

That does not mean, however, that Mr. Taunton's suggestions for cheaper installation work are to be condoned. Surely if standards got to such a low state to make it permissible to stick v.i.r. or p.v.c. on walls and ceilings, under floors and inside ceiling spaces, we should be "asking for it" with a vengeance. The existing standards set by the Wiring Rules Committee are quite satisfactory (although they could be usefully abbreviated) but these Rules are very often flagrantly infringed and until, or if, we contractors are put out of business by the B.E.A. we should still uphold the Rules as far as humanly possible.

Personally, I feel that a number of bona-fide contractors are "getting the wind up" unnecessarily because proper installation work has never been understood by the majority of supply authorities. If the Electricity Boards do tackle contracting work on a large scale they will have bitten off more than they can chew, with consequent losses to those who employ these authorities to carry out their work.

Glasgow. ALEX. MILNE, Senr.

Flameproof Motors

THE pressure generated by an explosion of a pentane-air mixture inside a core-cooled electric motor is the subject of a research report (No. 2) by H. Titman, B.Sc., Ph.D., and J. Haig, B.Sc., of the Safety in Mines Research and Testing Branch of the Ministry of Fuel and Power. It reopens discussion of the effects which turbulence and pressure-piling have upon the pressure developed within a flameproof enclosure. This subject has assumed fresh importance now that larger flameproof motors are being used, chiefly in the petroleum industry.

The report describes tests made with an 800 h.p. core-cooled "Metrovick" motor and methods of electric ignition, piezo-electric gauging and cathode-ray recording. The experimental data given indicate that when the motor is at high speed peak pressures are maintained for less than 0·05 millisec; they are transient and are exerted upon only a small area of the casing at any instant. Theory indicates that peak pressure of short duration will not correspondingly strain the casing.

Since it is the rate at which strain grows that controls fracture, it is better to gauge strain directly rather than to assess it indirectly from measurement of pressure. The use of multiple strain-gauges will determine actual values of strain at critical small areas and also the direction of principal stress in the plane of the surface. A second part of this report is to be prepared on casing strains corresponding to a variety of explosion pressures and waveforms.

Raw Material Situation

Allocations and Future Prospects

LAST week the Ministry of Supply announced that the allocation of imported virgin copper during March and April would be the same as in February, i.e., 85 per cent of the monthly consumption during the first half of 1950. Orders placed in February for April delivery would be subject to the usual premium. The proviso that orders for delivery after the month of order could not be accepted for more than two-thirds of the quota was withdrawn for March and April.

From 1st February until further notice monthly purchases of virgin lead from the Directorate of Non-Ferrous Metals would be restricted to a quantity not exceeding 90 per cent of the 1950 monthly average. The allocation of virgin zinc in March would be at the February rate.

Prospects for the supply of raw materials are dealt with in an article in the 17th February *Board of Trade Journal*. In this it is stated that there has been a falling-off in the supply of special shapes from Canada and supplies from Northern Rhodesia have been reduced by a coal shortage there. No supplies are at present available from Belgium. Lead, it is said, is not scarce in the sense that zinc and copper are but the market has hardened recently and shipping delays may cause some temporary inconvenience.

Shortages are most pronounced in the case of zinc. Restrictions have been placed on consumption and the re-establishment of controls to bring the acquisition of the metal under licence is foreshadowed.

Consumption of aluminium will have to be restricted to 15,000 tons a month in the first half of 1951. Although this is slightly higher than the monthly consumption in the first three quarters of last year the demand, which has increased, is likely to exceed the allocated amount. A long-term contract with the Aluminum Co. of Canada will provide an additional 50,000 tons of the metal in the latter half of this year, making 200,000 tons for the year, and 220,000 tons in each of the years 1952 and 1953. Nevertheless it is not yet possible to say to what extent, if any, this will improve the position of " civilian " consumers.

As regards iron and steel, the situation is uncertain, being governed by the supply of raw materials in which there are anxieties. Sheet steel supplies from America have fallen to negligible quantities and the rearmament programme is making increasing demands. One effect has been to reduce the amount available to the motor industry.

It has been necessary to reduce sulphur consumption and the production of sulphuric acid. One effect of the reduction in sulphur supplies, with which is coupled a shortage of zinc oxide, will be to restrict the output of rubber manufacturers.

Century of British Science

AT a meeting of the Royal Society of Arts in London last week Dr. D. McKie, Reader in the History of Science, University of London, delivered a paper on British science between the years 1851 and 1951. Prof. Sir John Simonsen, a vice-president of the Society, was in the chair.

Dr. McKie began by tracing the development of astronomy during the last century, after which he passed to atomic physics and from that to chemistry, physiology, physics, geology, meteorology and finally the biological sciences. He showed beyond doubt that during the period in question British scientists have played as great a part as those of other nations. Since the institution of the Nobel Prizes in 1901, British scientists have received awards for physics on thirteen occasions, a number exceeded by no other country. This indicates that we still hold the lead in physics which Newton gave us. In chemistry the Nobel Prize has been awarded to British chemists on seven occasions, and in medicine and physiology to British workers on nine occasions.

In the past century the study of science as a profession has begun in our universities, where the keynote of science is research, the state has organized and developed scientific services, and the output of scientific literature has enormously increased. The degrees of specialization have also become progressively finer.

The great change which has taken place since 1851 is that science now enters almost every daily activity of our lives. This has mainly been due to the realization of the value of science after the 1914–18 war. In spite of its dominant role in our lives science is pursued by the majority of its devotees for the disinterested love of truth for truth's sake.

Dimming Fluorescent Lamps

Methods Discussed at the I.E.E.

DURING recent years there has been a widespread increase in the use of fluorescent lamps and among the many problems which have arisen in connection with their further application is that of dimming, particularly for stage lighting purposes.

In a paper which was read at a Utilization Section meeting of the Institution of Electrical Engineers in London last week Mr. C. E. Williams (G.E.C.) discusses the fundamental requirements for the satisfactory dimming of low-pressure hot-cathode and cold-cathode fluorescent lamps. First of all he considers d.c. operation, after which the treatment is developed to cover a.c. circuits.

Lamp stability is then studied from the points of view of smooth control of current, supply-voltage variation, and intermittent extinction. Lamp circuits are generalized in terms of Thévinin's theorem, the ideas of voltage control and impedance control also being introduced. The author then discusses practical circuits, mentioning the difficulties of multiple-lamp control and the means by which the latter can be overcome. The separate impedance method of control is subsequently described by reference to several circuits and methods of unifying control are suggested.

In conclusion, Mr. Williams explains that to obtain good dimming it is necessary to ensure that adequate open-circuit voltage across the lamp terminals is available if impedance control is used. Alternatively, if voltage control is used the series impedance must be above a critical value. Circuits are available which satisfy these conditions and give a good range of dimming. The main problem of dimming is the economical control of large installations.

DISCUSSION

Opening the discussion, Mr. H. R. Ruff (B.T.H. Co.) said that the additional complexity of fluorescent lamp dimming gear involved greater cost, which must be borne in mind when considering schemes for the use of fluorescent or incandescent lamps, but where the fluorescent lamp could be wisely applied—where the lamps were often at full brilliance, but had to be dimmed occasionally—the dimming schemes described in the paper would be a useful tool for lighting engineers. He was afraid, however, that the conditions existing in this country at present might hold back their general application to some extent.

Trial Hot-Cathode Installation

The main problem was the simplification of the bulk control of fluorescent lamps, and the author mentioned an effort to reduce this complexity by means of series h.v. transformers. Recent work by the B.T.H. Co. had led to a field trial of a similar system with hot-cathode lamps, in which, by using transformers as impedances, they had managed to dim from one common resistor-dimmer on a straight a.c. circuit up to 18 lamps, the control being taken down to about 0·5 per cent light output by compensating for the magnetizing current in the transformers.

Dr. J. W. Strange (Thorn Electrical Industries) suggested that economics dominated the development described. The House of Commons installation was interesting, but there, presumably, expense did not matter. In buildings such as theatres, however, competition was encountered from well-established methods. The cold-cathode lamp was ruled out by the high voltage required, and hot-cathode mains-operated lamps were the only answer. During the last year, three permanent installations had been made in this country for stage lighting using hot-cathode fluorescent lamps, and he believed that the gardens in the Festival of Britain would be illuminated by the same process.

Mr. S. Anderson (G.E.C.) said that the provision of good dimming for fluorescent lamps was a complex matter compared with the use of filament lamps and resistance dimmers, but he felt it was worth while. The fluorescent lamp had come to stay and

it would be a pity to have to revert to the older light-source whenever it was desired to vary the intensity of the light smoothly. Moreover, there were advantages in the characteristics of fluorescent lamps, not the least of which was the maintenance of a relatively constant colour of the light output at all stages of dimming.

Mr. A. G. Ramsey said that in some cases it might be necessary to maintain an illumination within the dimming range, which might mean continuously-rated instead of intermittently-rated dimmers.

Mr. R. V. Mills (British Thomson-Houston Co.) asked whether the amount of dimming required for lamps of different colours was the same.

Mr. F. B. B. Winter (Major Equipment Co.) did not see much application for the cold-cathode lamp for theatre lighting, but said that the hot-cathode lamp could be used for lighting cycloramas and backcloths for the variety and music hall stage in particular. For plays, individual high lighting of acting positions was normally employed, and for this incandescent lighting, which could be dimmed perfectly, seemed the only method.

Mr. A. N. Irens (chairman of the Utilization Section) said that it was a very good thing that so many people in different laboratories were all trying to achieve the same objective, because there were so many possible final solutions that it was appalling to think of some planner coming along and saying " This is a waste of effort, and we should have one laboratory only."

The author, in reply, said that the variation of colour over the range of dimming was negligible with most lamps, the only exception being the neon cold-cathode lamp with a fluorescent coating to give an overall orange or gold colour. So far as the relationship of lamp current and lamp brightness was concerned, the amount of light was approximately proportional to the lamp current, though there might be an error of about 20 per cent at the lower currents in the assessment of how much light was going to be obtained.

Installation Inspection

Proposals for Council and Board

DISCUSSIONS are still going on between the British Electricity Authority, the Electricity Boards and the Electrical Contractors' Association regarding the proposal to establish a National Inspection Council for electrical installation work. Added to the proposal is a further suggestion that an Inspection Board should be set up to carry on the actual work of inspection.

The Electricity Boards are to be asked what interpretation they put upon Section 27 of the Electricity Commissioners' 1937 Regulations as supply authorities—whether they should maintain their own inspection staff or ask the National Inspection Council to undertake the work on their behalf.

It has been agreed that the Council should, at the outset, confine itself to new installations. One ancillary matter discussed has been a minimum Code of Practice for wiring installations and the opinion has been expressed that any minimum code should be based on the I.E.E. Regulations.

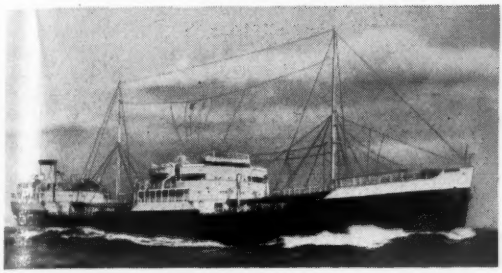
The Organizing Committee has given consideration to the opinion of the legal advisers of the B.E.A., both with regard to membership of the Council and the Board, and to the registration of the National Inspection Council either as a non-profit making company or a trade union. Representatives of the contracting interests have raised the question of what degree of sanction should be applied to contractors and operatives who did not comply with the requirements and conditions of the Council. It was felt that the contractors' protective association should have the right to endorse or appeal against any decision to strike a contractor off the register.

As regards manual operatives, it was doubted whether the time was ripe for compulsory registration. The suggestion has been made that an application be made to the Ministry of Fuel and Power for the registration of the N.I.C. inspector as being authorized to carry out inspection under para. 33 of the 1937 Electricity Supply Regulations.

It has been stated that 15 inspectors would be required to deal with an estimated 7,000 installations per annum, at a cost of £20,000 the first year, rising to £40,000 per annum when the setting up and staffing of the Council was complete. Consideration has been given to various sources of revenue, but the matter is not being proceeded with for the time being, so as to give the Electricity Boards an opportunity of presenting their views.

Marine Gas Turbine Propulsion

Unusual A.C. Parallel Operation



Starboard view of the "Auris" experimental electrically propelled oil tanker

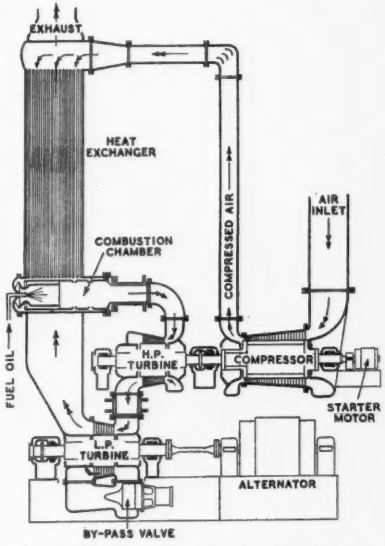
THE main propulsion machinery of the 12,290-ton oil tanker *Auris* is noteworthy in several respects. Each of four diesel engines drives a 1,100 kVA alternator at 1,600 V and 375 r.p.m. which together energize one motor of 3,750 s.h.p. at 120 r.p.m. on the single propeller shaft.

Any number of machines can be paralleled without the aid of synchronizing gear and maintained rigidly in step at all times, even during "dead circuit" reversal switching, while auxiliary a.c. can be taken from the main alternators during manœuvring periods without withdrawing a machine from the propulsion circuit for this purpose.

The alternators have double-unit stators and double-unit salient-pole rotors. The outputs of one half-unit of each of the four alternators are paralleled on to synchronizing busbars, while the total outputs from the four machines are paralleled on to the main propulsion busbars. By controlling the excitation of one group of half-unit alternators, the voltage across the main busbars can be reduced to zero for lowering speed and for reversal switching; the alternators are held electrically in step by their interconnection to the synchronizing busbars and have amplidyne field regulation.

Various a.c. auxiliaries and the exciters are energized from the synchronizing busbars. The remaining d.c. auxiliaries are supplied from generators tandem driven by the exciters. Thus, when at sea, all power can be furnished by the diesel-alternator sets, one of which can readily be withdrawn from service for cruising at maximum economy speed.

This tanker, which has now been in sea service for three years, is the first successful British diesel-electric vessel to be equipped for a.c. propulsion on this B.T.H. system and, moreover, will be the first ship to have a full-scale gas turbo-alternator for propulsion. The latter is of substantially the same rating as one of the existing diesel-alternator sets for which it is to be substituted within the next two months. The vessel was expressly built for the Anglo-Saxon Petroleum Co. for



Diagrammatic representation of gas turbo-alternator and heat exchanger for ship propulsion

experimental comparison in actual sea-going service.

By arrangement with the Shell Petroleum Co., the turbo-set was inspected last week on the test bed in the B.T.H. works, Rugby. The space in which it is to be installed, particularly the narrow width, led to the adoption of vertical compounding and also restricted heat recovery in the exchanger to a thermal ratio of 50 to 52 per cent.

Because of the small mass flow of air, intercooling during compression was out of the question. The set was designed for a moderate initial gas temperature to ensure an adequate length of life. This design condition limited the thermal efficiency obtainable, but low fuel consumption is of secondary importance in this installation, the primary task being to ascertain whether a gas turbine will satisfy marine requirements in respect of reliability rather than thermal performance.

Air taken through the compressor without filter passes to the heat exchanger inlet drum, thence through tubes to the two outlet drums, one on each side of the turbine exhaust; each incorporates a silica lined combustion chamber whence hot gases pass through the h.p. turbine (which drives the compressor), into the l.p. turbine (driving the alternator) and then flow outside the heat exchanger tubes, longitudinally and substantially contra-flow to the compressed air inside the tubes, discharging to atmosphere.

The frame permits the set to be handled as one piece; it is made up of three sub-assemblies which may be treated as separate units during erection. The l.p. turbo-alternator is within the base, which also contains the alternator air cooler and lubricating oil tank. Bolted on top is the fabricated frame of the h.p. turbo-compressor with overhung starting motor.

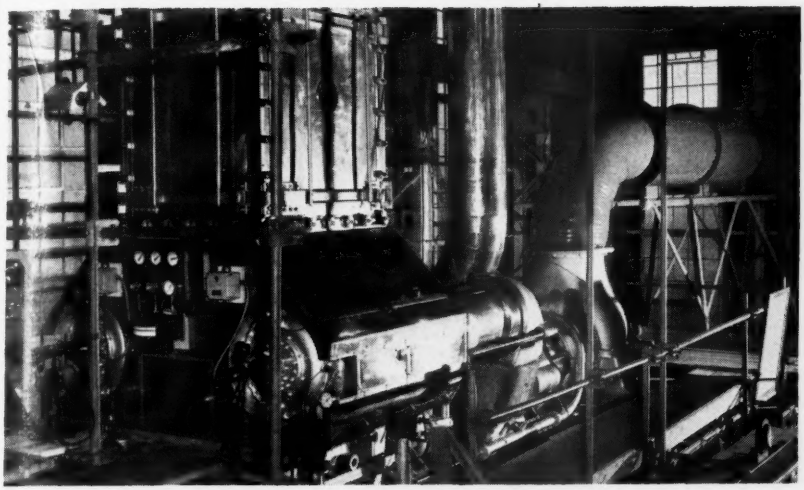
The axial-flow compressor was independently tested in 1949. From 26th June to 22nd December, 1950, the turbine set was operated for 124 hours, of which 46 hours were at one-quarter load or less and 78 hours at greater loads, for combustion and mechanical adjustments. Slight distortion of the h.p. turbine casing after 25 hours did not progress; another 62 hours' operation showed the running clearances to be unimpaired. Unsatisfactory combustion (smoky exhaust) deposited fine soot on the heat exchanger tubes, but none at all on the turbine blading. A high-pitched noise was reduced by a silencer in the air intake.

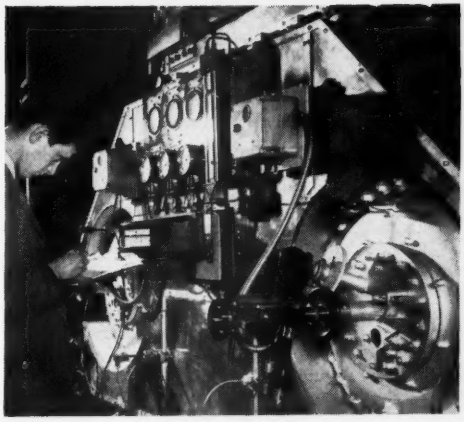
During performance and endurance tests from 1st January to 9th February, 1951 (Table I) the set operated for 193 hours on gas-oil (including a continuous performance test of 100 hours' duration) and for 335 hours on heavy oil of a viscosity of 1,500-seconds-Redwood No. 1 at 100 deg F, including a continuous run of 270 hours, mainly at full load. The set has thus run for a total time of 652 hours to date. The thermal efficiency is based on the net (lower) heat value of the fuel oil, which was 18,300 B.Th.U./lb for gas-oil

TABLE I.—GAS-TURBINE PERFORMANCE TESTS

Item	4th Jan., 1951, Full Load GAS-OIL		25th Jan., 1951, Max. Load HEAVY OIL
	Test readings	Corrected to design conditions	Test readings
Compressor inlet :—			
deg C (F)	6 (43)	20 (68)	4 (39)
lb/sq in, abs	14·13	14·64	14·17
Compressor outlet :—			
deg C (F)	160 (320)	182 (360)	167 (332)
lb/sq in, abs	56·17	58·24	60·03
Combustion chamber inlet :—			
deg C (F)	252 (485)	278 (532)	260 (500)
lb/sq in, abs	55·61	57·61	59·41
H.p. turbine inlet :—			
deg C (F) reading	558·5 (1037)	601 (1113)	585 (1085)
calculated* ..	556 (1033)	598 (1109)	589 (1092)
lb/sq in, abs	54·10	56·09	57·83
L.p. turbine inlet :—			
deg C (F)	412 (774)	447 (837)	438 (820)
lb/sq in, abs	22·58	23·41	23·50
Isentropic efficiency, % :—			
Compressor	87·0		86·3
H.P. turbine	85·2		84·3
L.P. turbine	88·4		89·5
Heat exchanger :—			
Gas inlet deg C (F) ..	344 (651)	375 (707)	361 (682)
Gas outlet deg C (F) ..	250 (482)	276 (529)	258 (496)
Pressure drop lb/sq in ..	0·21	0·23	0·26
H.p. turbine r.p.m.	5850	5996	6000
L.p. turbine r.p.m.	2800	2870	2940
Compression ratio	3·98	3·98	4·24
Air mass flow lb/sec	27·6	27·9	28·8
Fuel consumption lb/hr ..	773	821·5	925
Alternator output (corrected kW)	875	930	1022
Fuel rate lb/kWh	0·884	0·884	0·905
Overall thermal efficiency, %	21·1	21·1	21·1

* It is difficult to measure accurately the temperatures at h.p. turbine inlet; this entry therefore sets out calculated values derived from the l.p. turbine-inlet temperatures that are reliably recorded.





Above: **Vertical heat exchanger and compound gas turbo-alternator on test at Rugby.** *Right:* **Combustion chambers, showing fuel-oil burners and temperature gauge board**

and 17,650 B.Th.U./lb for the heavy oil.

The maximum load run on 25th January, 1951, in connection with alternator tests, did not allow steady heat-exchanger temperatures to be reached. Although the turbine inlet temperature at full load is about 50 deg F lower than the designed figure, the fuel consumption is about 10 per cent. less than the expected amount. Fuel consumption at no-load is about 100 lb/hr when the l.p. turbine idles at 1,500 r.p.m. and about 200 lb/hr at 3,000 r.p.m., which is half full speed.

A dual-purpose valve acts as a safety device and also as a starting accessory. The set is started by a 50 h.p. motor driving the h.p. shaft (with the by-pass valve open to relieve the turbine of back-pressure) up to 1,200 r.p.m., or 20 per cent of full speed, when the fuel burners are ignited by electric spark. The compressor is thus accelerated by the h.p. turbine with diminishing assistance from the motor, the torque of which falls to zero at a shaft speed of 1,800 r.p.m., whereupon the motor is automatically disconnected and the by-pass valve closed to admit hot gas from the h.p. to the l.p. turbine. During the starting cycle a peak turbine inlet temperature of 480 to 540 deg C (900 to 1,000 deg F) is reached, which falls gradually to 330 to 400 deg C (652 to 750 deg F) at the " idling " speed of 3,000 r.p.m., or half full speed.

All the electrical machines, switchgear and gas turbine referred to were designed and manufactured by the British Thomson-Houston Co., Ltd., and the ship was built by Hawthorn, Leslie & Co., Ltd.

NEW BOOKS

Statistical Year Book of the World Power Conference, No. 5. Edited by Frederick Brown, B.Sc.(Econ.), F.S.S. Pp. 128. Central Office, World Power Conference, 201, Grand Buildings, Trafalgar Square, London, W.C.2. Price £1 10s.

The second post-war issue of what we believe to be the most comprehensive tabulated statistics extant on fuel and power production and utilization relates to 1946 and 1947 and includes some figures for 1948. Its range covers the annual production of solid, liquid and gaseous fuels, water power and electricity, showing imports and exports and amounts used for domestic and industrial purposes. The totals are necessarily incomplete, because full data in regard to some countries are not obtainable and returns are no longer made by the U.S.S.R. and countries within its sphere of influence. Resources are dealt with only when the particulars contained in the previous edition need revision.

Statistics of electricity supply occupy 21 pages and are divided into production and distribution by public undertakings and by private industrial plants. Under production come kW installed, kWh generated from steam, internal combustion engines and water (river flow and storage separately). Utilization figures are given for six classes of consumers. A notable omission from the important table relating to industrial generation is the United Kingdom, which is strange, having regard to the complete and long-standing records available from public supply systems in this country.

Data regarding coal will be made more valuable when the higher ranking kinds can be segregated by international agreement, studies for which are now in hand. A useful feature of the book is the analytical comparisons of the statistics, which throw light on their general trends.—C. O. B.

Voltage Stabilisers. By F. A. Benson, M.Eng., A.M.I.E.E. Pp. 125; figs. 97; index. *Electronic Engineering*, 28, Essex Street, London, W.C.2. Price 12s 6d.

This little book meets a definite want in reviewing a vast literature of various voltage stabilizing devices and giving fairly adequate descriptions of many now available. Should the reader wish to go more deeply into any particular scheme, no fewer than 292 references are given. The stabilizers covered are those employing magnetic saturation, glow discharge tubes, thermionic valves, miscellaneous types using barretters, "Metrosil" lamps, etc.

Reference is not, however, made to transformer tap-changing devices,[1] the automatic moving coil regulator,[2] or carbon piles,[3] all of which have been developed on a commercial scale. Another system which might have been mentioned operates by controlling the firing points of thyratrons.[4] The question of response time might also have been dealt with, as this is frequently a limiting factor. In citing the ingenious series-parallel valve circuit of Fig. 47 (which deserves to be better known than it is) the author might either have shown how to determine the value of the resistor which compensates for the effect of changes of load current, or indicated where this information could be obtained. Although he does not say so, the circuit is given in his ref. 188, but it would be interesting to learn where it orginated.

Despite its limitations, there is still sufficient in the book to make it a useful contribution to the art of voltage stabilization and, as such, it can be safely recommended.—J. K. W.

The references made are:— [1]"Voltage Regulators for A.C. Mains," S.T.C. pamphlet. [2]"A Modified Moving-Coil Voltage Regulator of High Sensitivity," N. W. W. Ellis, *Jnl. Sci. Instr.*, Vol. 27, No. 9, Sept., 1950, p. 248. [3]Manufactured by Newton Bros. of Derby and by J. Stone & Co., Ltd., Deptford, London. [4]"Telegraph Power Supplies from A.C. Mains," S.T.C. pamphlet.

Books Received

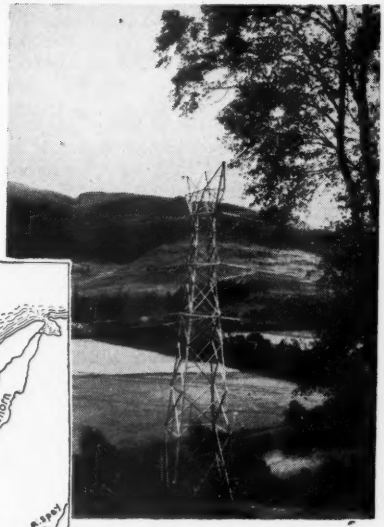
Television Receiving Equipment By W. T. Cocking, M.I.E.E. Pp. 375; figs. and index. (Third Edition.) Published for *Wireless World* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 18s.

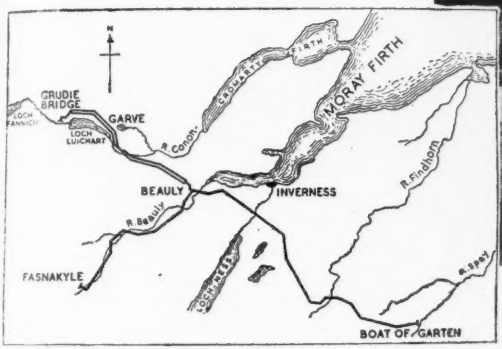
Principles and Practice of Radar. By H. E. Penrose and R. H. S. Boulding. Third edition. Pp. 708; figs. and index. George Newnes & Co., Ltd., Tower House, Southampton Street, W.C.2. Price 42s.

Progress in Power Cable Developments. By C. C. Barnes, A.M.I.E.E. Pp. 37; figs. 12; index. Association of Engineering and Shipbuilding Draughtsmen, 96, St. George's Square, London, S.W.1. Price 2s.

Scottish Power Lines

Work in a Rugged Area

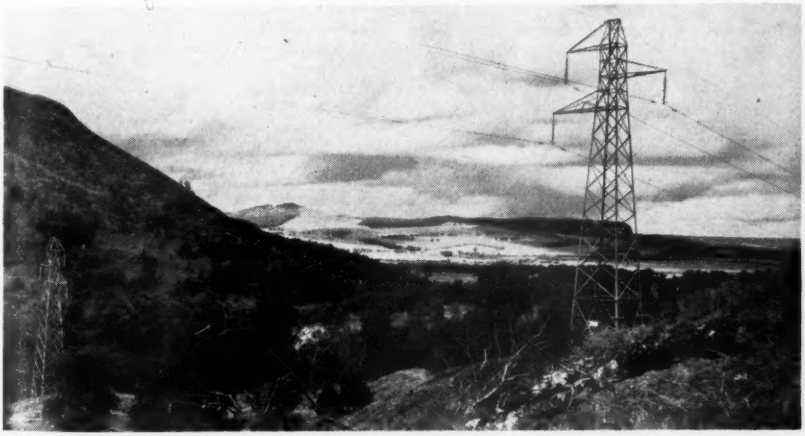




Above: Double circuit earth wire changeover tower. Below: Single circuit towers on Fannich-Beauly section

THE erection of transmission lines for operation at up to 132 kV is not usually regarded as work that calls for special comment. Nevertheless, a 132 kV overhead transmission line contract undertaken recently by W. T. Henley's Telegraph Works Co., Ltd., for the North of Scotland Hydro-Electric Board involved installation work in such rugged and inaccessible regions that there have been quite a number of interesting and unusual features.

The contract comprised the erection of 74 miles of steel tower line between Grudie Bridge power station (which is fed by pipeline from Loch Fannich, *Electrical Review*, 22nd September, 1950) and Boat of Garten.



This line runs by way of the Beauly substation where it is joined by the line from Fasnakyle to Beauly, which is about 16 miles long and was also included in the contract.

For about 16 miles between Grudie Bridge and Beauly the system is split into twin single circuit lines running parallel at a distance of about 150ft apart. This was done to minimize the effect of possible interference from lightning storms which are prevalent over this section of the route. The remainder of the line is of double circuit construction. The conductors are 0·175 sq in copper equivalent steel core aluminium.

At Boat of Garten substation there is an interconnection with an existing line connecting Keith and Errochty. Because of the rugged terrain over which most of the line had to be erected an unusually wide range of types of towers were installed. Various forms of transport, including caterpillar tractors, power winches, mules, aerial ropeways and an improvised funicular railway, were used to haul foundation materials, tower steelwork, conductors and accessories over the mountainous country. At the most inaccessible positions these materials had to be manhandled to the individual tower sites.

In addition, pneumatic compressors, concrete mixers, power pumps and other heavy plant were manœuvred into position for installing the foundations, in which solid rock, peat and running sand were encountered in considerable quantities. These and the predominance of hillside slopes in many instances involved the design of special foundations. The provision of an adequate labour force presented its own particular problems to meet which it was found necessary to establish a labour camp at Beauly. The consultants for this contract were Messrs. Kennedy & Donkin.

Festival Electricians' Wages

Employers' Protest Against Committee's Award

As we briefly reported last week, the Conciliation Committee set up by the Minister of Labour and National Service recommended that the electricians employed on the Festival of Britain sites at Thames South Bank and Battersea Park, should be granted the extra 2d an hour for which they ceased work "unofficially" in January and February.

In its report the Committee surveys the circumstances. It refers to an agreement made in August last between the National Federated Electrical Association and the Electrical Trades Union providing for the payment of an additional 2d an hour to adult operatives engaged in electrical installation work in the preparation and dismantling of exhibitions at Olympia, Earls Court and the White City, London. This agreement specifically excluded exhibitions at other places. The N.F.E.A. had given notice to terminate the agreement in September next.

In presenting the electricians' case the Electrical Trades Union said that the men felt aggrieved by the fact that building operatives at the Festival sites were being paid a bonus which gave them 3½d an hour more than the electricians. The Union considered that an extension of the August, 1950, agreement was the most effective way of rectifying this.

The N.F.E.A. pointed out that conditions at Olympia, Earls Court and the White City were peculiar to those places. The Festival buildings were, in a sense, "permanent" although some would later be pulled down. It was felt that the claim was made only as a device to decrease the difference between the wages of the building operatives and the electricians and it would have repercussions throughout the country.

Nevertheless the Committee, while deprecating the men's unofficial strike, held that conditions at the Festival sites were exceptional and recommended that the agreement should be extended to cover the sites and that the increase should date from 26th January, when the first strike began.

In later comments on the Committee's report the N.F.E.A. reiterates its view that there is no justification for the extension of the agreement to the Festival sites. It goes on to say that "in view of the extreme pressure which has been exerted through the Ministry of Labour and National Service and in other directions, it feels it has no alternative but to request its members to pay an addition of 2d per hour to all adult operatives engaged on the work in question but not by means of an extension of the agreement of 28th August, 1950. This, however, is subject to all its members concerned being properly reimbursed for the extra cost involved by the unconstitutional strikes which have taken place and by the insistence that an unwarrantable payment of 2d an hour extra shall be made."

Commerce and Industry

Engineering Wages Dispute

Electricity Supply Employees' Inventions

LAST week after a meeting of representatives of the Confederation of Shipbuilding and Engineering Trade Unions and the Engineering and Allied Employers' National Federation a joint appeal was made to workers in the engineering industry to return to normal working.

At the invitation of Sir Robert Gould, Chief Industrial Commissioner of the Ministry of Labour, the executive of the Confederation of Shipbuilding and Engineering Unions went to the Ministry on Monday last to discuss the ban on overtime and piecework.

After a two-hour discussion it was decided that the meeting should be adjourned until later in the week when the employers' representatives would participate.

Diesel Sets for Australia

George Clark (1938), Ltd., Sunderland, are expected to begin delivery in July of the first of six eight-cylinder Sulzer engines they are building for generating sets to be installed in Australian power stations. The manufacture of this type of engine is a new development of the company brought about by an agreement with Sulzer Brothers.

Lighting Fittings Showroom

The lighting fittings business of Fredk. Thomas & Co., Ltd., was commenced in 1888 and is one of the oldest in London. Just before the war a scheme of reconstruction was commenced in the basement of the company's works at Everton Buildings, Stanhope Street, London, N.W.1, to provide showrooms for the use of contractors, wholesalers and architects. The war caused a suspension of the scheme and the basement was used as an underground shelter. After the war delays in obtaining the necessary licences held up the progress of reconstruction. The work has now been completed, however, and the result is an up-to-date showroom displaying a comprehensive range of lighting fittings, including modern and period fittings and commercial and industrial designs. All the fittings are separately wired for demonstration purposes. The company produces all kinds of special fittings to customers' own schemes or to its own suggestions and designs.

A view of the new lighting fittings showroom of Fredk. Thomas & Co., Ltd., at the Stanhope Street Works

Radio and Telecommunications

The scope of Census of Production Report No. 127: Radio and Telecommunications Trade, preliminary details of which were published last week in the *Board of Trade Journal*, covers "electric light bulbs and discharge lamps" in addition to telegraph and telephone apparatus, radio apparatus and gramophones. It relates to all establishments employing ten or more people which were engaged wholly or mainly in the manufacture of such equipment in 1948. In that year the number of establishments operated by private firms was 396 compared with 156 in 1935, while those of Government Departments numbered 15 against 20.

The value of production (gross output) by private firms, with net output in parentheses, was as follows: 1948, £109,125,000 (£59,711,000); 1946, £77,521,000 (£43,740,000); and 1935, £27,910,000 (£15,077,000). Comparable figures for Government Departments were: 1948, £44,533,000 (£33,830,000); 1946, £35,045,000

(£28,636,000); and in 1935, £11,950,000 (£8,526,000). The average number of persons employed by private firms in 1948, excluding outworkers, was 133,391 and by Government Departments 67,191; in 1946, 122,599 and 64,996; and in 1935, 65,729 and 36,192. Net outputs per person were: 1948, £448 (private firms) and £503 (Government Departments); 1946, £357 and £441; 1935, £229 and £236.

The capital cost of new buildings acquired during 1948, together with extensions, amounted to £434,000 (excluding site value) for private firms and £2,000 for Government Departments. New plant, machinery and vehicles cost private firms £2,601,000 and second-hand equipment £259,000. Government Departments purchased new equipment to the value of £11,000.

Salaries and wages paid to the employees of private firms in 1948 aggregated £38,667,000 and to those of Government Departments £24,228,000.

Denis Ferranti Co.

The Pearson Electric Co., Ltd., Rhos Mill, Higginshaw Lane, Royton, Oldham, Lancs, has changed its name to Dénis Ferranti Co., Ltd. The management will be in the hands of Mr. A. Wanless, former director of the Pearson Electric Co., Dewsbury, whose plant Mr. Denis de Ferranti recently took over. This plant is being transferred to the Rhos Mill. We recently reported the retirement of Mr. Denis de Ferranti from the board of Ferranti, Ltd. and from the position of general manager of the company.

Electricity Employees' Inventions

The National Investigation Committee of the Electrical Power Engineers' Association has drawn up proposals, as a basis of discussion with the employers, for the treatment of ideas and inventions of employees of the Electricity Boards arising from their work with the Boards. It is suggested that a representative panel shall be set up to examine and report upon ideas and inventions from various aspects. If an invention is found to be useful it is proposed that the Board concerned shall, at its own expense, take out a patent in the joint names of the Board and the inventor. The cost of developing patents would be met from a Central Development Fund to which the Boards would contribute. Methods of rewarding the inventors and of securing development by outside bodies or interests are other matters covered.

Electrical Managerial Positions

An understanding has been reached between the British Electricity Authority, on the one hand, and the Association of Managerial Electrical Executive, the National Association of Local Government Officers and the Electrical Power Engineers' Association, on the other, on the terms of the agreement establishing negotiating machinery for managerial grades in the electricity supply industry. Six sub-committees will be formed to deal with various classes; they will make recommendations to the National Joint Managerial and Higher Executive Grades Committee. One of these sub-committees will deal with the superintendents of power stations of 50 MW or over and another with district managers with salaries of £1,000 or more.

Safety and Welfare Regulations

The Ministry of Labour and National Service has just issued a pamphlet (H.M. Stationery Office, price 1s 6d) which contains a revised preliminary draft of Regulations under the Factories Acts, 1937 and 1948, on safety, health and welfare in connection with work of engineering construction. This draft is a revision of a first preliminary draft published by the Ministry in 1945. Amendments now contemplated are numerous, and the revised draft is published for study and consideration by persons affected.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £124 0s 0d
COPPER, H.C. Electro	ton £202 0s 0d
Fire Refined 99·7 per cent ..	ton £201 0s 0d
Fire Refined 99·2 per cent ..	ton £200 10s 0d
LEAD, English	ton £137 10s 0d
MERCURY	flask £73 10s 0d
TIN	ton £1,505 0s 0d
ZINC, G.O.B. Foreign	ton £151 0s 0d
Electrolytic	ton £155 0s 0d
BRASS Tubes	lb 1s 9½d
Sheet	lb 2s 1½d
Wire	lb 2s 3½d
COPPER Tubes	lb 1s 11d
Sheet	ton £252 0s 0d
H.C. wire and strip	ton £226 10s 0d
PHOSPHOR BRONZE	
Wire	lb 3s 5½d
RUBBER, No. 1 R.S.S. spot ..	lb 66d

Promotion in National Industries

The third of the series of papers on nationalized industries produced by the Acton Society Trust, Acton House, Church Road, Claygate, Surrey, is entitled "Problems of Promotion Policy" (price 2s). It is a study of the methods of selecting men for higher positions—those actually in operation and those which might be adopted to produce the best results.

The principal problem is whether promotion should be by seniority or merit and the arguments for and against each system are put forward. It is seen that the matter resolves itself into a conflict between the employees' desire for promotion and the public's need for a satisfactory and efficient service. Means are suggested of rewarding employees for long service as an alternative to promotion for which

they are not fitted. A warning is uttered against too-rigid systems of promotion. Procedures adopted in various nationalized services are set out in an appendix.

New Falk, Stadelmann Showrooms

New electrical showrooms have been opened by Falk, Stadelmann & Co., Ltd., at 19, Union Street, Bradford. A preview was held on 31st January, when members of the electrical trade were invited to inspect the comprehensive display of all types of decorative, commercial and tungsten lamp fittings, both in period and modern designs, and a wide range of fluorescent fittings and domestic appliances. Mr. C. J. Falk, sales director, and Mr. E. V. Brown, local director and Leeds Branch manager, were present. The trade counter on the lower ground floor carries a complete stock of electrical accessories, cable, switchgear, domestic appliances, glassware, etc.

Stud Welding Demonstration

For the benefit of those concerned with building construction, practical demonstrations of the well-known "Nelson" stud welding equipment were given in London last week by engineers of Crompton Parkinson, Ltd., in collaboration with Holland and Hannen & Cubitts, Ltd. Methods of fixing by end-welded studs were first explained through the medium of an excellently produced coloured film, after which visitors were able to operate the "Nelson" stud welding gun and prove for themselves the speed, simplicity and reliability of the system.

Proposed Exeter Electric Club

A meeting was held at the Rougemont Hotel on 14th February at which representatives of various sections of the electrical industry in Exeter and district were present. The purpose of the meeting was to discuss the possibility of the formation of an Electric Club in Exeter, run on similar lines to Clubs which are at present functioning in Birmingham and Bristol. Mr. A. T. Haywood, president of the Birmingham Electric Club, addressed the meeting, and outlined the aims, objects and constitution of that Club. The chairman of the meeting, Mr. G. S. Mogridge, said that the attendance of sixty people seemed to indicate that such a Club was needed in Exeter. It was decided to form a temporary committee to go into details.

E.D.A.-E.A.W. Conference

Mr. P. J. Noel-Baker, Minister of Fuel and Power, has consented to open the E.D.A.-E.A.W. conference of housecraft advisers, senior demonstrators and showroom assistants, on 7th March. The conference, which is to be attended by 400 delegates from all parts of Great Britain and Northern Ireland, is to be held in the Cowdray Hall, Henrietta Place, London, W.1.

In connection with the conference an exhibition of floor maintenance equipment and steam-electric cooking will take place in the nearby Seymour Hall, Seymour Place. On the Wednesday it will be confined to those attending the conference, but on 8th March the exhibition will be open, free of charge, to the general public. Practical demonstrations will be given throughout the day of the latest electrical labour-saving devices for floor sanding, floor scrubbing, drying, polishing and burnishing, and carpet shampooing. Visitors will be invited to use the equipment which is being provided by Truvox Engineering Co., Ltd., Cimex, Ltd., and R. G. Dixon & Co., Ltd. The Gillott electro-steam cooker will also be on view.

Valve and Circuit Noise

A survey of the existing knowledge concerning the subject of valve and circuit noises in electronic equipment, and outstanding problems in this field, is contained in Radio Research Special Report No. 20, "Valve and Circuit Noise," which has just been published for the Department of Scientific and Industrial Research by H.M. Stationery Office, price 9d. In addition to dealing with valve noise and thermal noise in electronic circuits, it also covers noise in photo-electric cells, semi-conductors, crystal rectifiers, gas discharges and magnetic field devices.

Cookers for Brisbane

Relco, Ltd., which acts as export distributor for Elexcel, Ltd., has just negotiated a contract with the City Electric Light Co., Ltd., Brisbane, Queensland, Australia, for the supply of 1,150 "Xcel" cookers, to an approximate value of £27,000. This order follows an original contract negotiated with this supply authority for 600 cookers in 1948.

Exhibition of Scientific Apparatus

An invitation to United Kingdom manufacturers to participate in an Exhibition of Scientific Apparatus, to take place from 20th to 31st August next, has been received through the British Embassy at Brussels. The organizers, the Union Geodesique et Geophysique Internationale, state that the exhibition will cover the following branches: geodesy, seismology, meteorology, terrestrial magnetism, atmospheric electricity, oceanography, hydrology and international terrestrial physics. The exhibition will coincide with the ninth general meeting of the Union and will be held in the premises of the University of Brussels. Space will be freely placed at the disposal of exhibitors,

whose only costs will be for insurance, packing and transport. Applications should be addressed to Prof. Dr. J. Van Mieghem, Comité Organisateur de la IXe Assemblée Générale de l'U.G.G.I., 157, Groeselenberg, Uccle, Brussels.

Trade Announcements

Brookhirst Switchgear, Ltd., announce that they have opened a Newcastle office at Lloyds Bank Chambers, 15, Sandhill, Quayside, Newcastle-on-Tyne, 1, and that Mr. T. G. Evans has been appointed district manager. Mr. Evans, who has been assistant to Mr. H. H. Renfree (district manager at Leeds) will be responsible for the company's interests in Northumberland and Durham.

Everett, Edgcumbe & Co., Ltd., have appointed the Aberdare Electric Co., Ltd., Aberdare Works, Finglas, Co. Dublin, as their agents in Northern Ireland and the Republic of Ireland.

Bill Switchgear, Ltd., has opened a Scottish area depot at 156/158, St. Vincent Lane, Glasgow (telephone : Central 0960), in the charge of its Scottish area manager, Mr. J. D. Harris.

Birmingham Commercial Travellers

The second annual dinner-dance of the Birmingham and District Branch of the Electrical Trades Commercial Travellers' Association will be held on 9th March at New Inns Hotel, Handsworth, Birmingham. Any profits from the function will be divided between the Royal Commercial Travellers' School and the Electrical Industries Benevolent Association. Tickets can be obtained from the entertainments secretary, Mr. F. A. Bartham, Electrical Trades Supply, Ltd., Great Charles Street, Birmingham, 3.

Changes of Name

Christy Brothers (Chelmsford), Ltd., have changed their name to Christy Bros., Ltd.

The title of Brooks and Bohm (Electrical), Ltd., has been changed to Etherington & Partners, Ltd.

George Forest & Son, Ltd., have changed their name to G. F. & Co., Ltd.

Apprentice Training Scheme

A scholarship scheme for apprentice training at the Brush A.B.O.E. group of factories in Britain for engineering graduates from universities all over the Commonwealth has been announced by the group's chairman, Sir Ronald Matthews. The first twelve months of each course of the scheme is intended to provide a general training in basic manufacturing procedure, after which the apprentice will receive more specialized training at the different factories of the group. Throughout the course apprentices will be able to meet senior members of the staff and experienced technical specialists who will guide them on particular aspects of their study. A free return passage from the apprentice's home to England will be provided together with additional travelling expenses. Wages will be the same as those paid to other graduate apprentices. A well-illustrated 16-page brochure, in which an application form is enclosed, has been produced in connection with the scheme.

Sir Ronald also announced an offer for the engineering staff of the overseas subsidiaries of the group to aid technical education in the various Commonwealth countries.

Catalogues and Lists

Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester.—Booklet announcing revised prices of "Nettle" accessories.

Julius Sax & Co., Ltd., 24, Commerce Road, Brentford, Middx.—Priced leaflet on flashing type luminous call indicators.

Sharp Control Gear, Ltd., King's Norton, Birmingham, 30.—Wallet containing a series of 12 leaflets on motor control gear and industrial switchgear.

S. O. Bowker, Ltd., 19-21, Warstone Lane, Birmingham, 19.—Priced and illustrated catalogue of "Tenby" electrical accessories.

Ekco-Ensign Electric, Ltd., Southend-on-Sea, Essex.—Priced leaflet on coloured fluorescent lamps.

Brush Electrical Engineering Co., Ltd., Loughborough.—Folder (No. 11091) announcing a widened range of single-phase f.h.p. motors arranged for solid foot, resilient and flange mounting, and for split phase and capacitor starting.

Arrow Electric Switches, Ltd., Hanger Lane, Ealing, London, W.5.—Illustrated catalogue (H) of rotary and tumbler switches, switch units, etc.

Sturtevant Engineering Co., Ltd., Southern House, Cannon Street, London, E.C.4.—Catalogue (No. 9602) of laboratory machinery.

Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester, 17.—Illustrated brochure indicating the company's range of motors for industrial purposes.

Hellermann Electric, Ltd., Tinsley Lane, Crawley, Sussex.—Catalogue illustrating the applications of "Helvin," an elastic form of p.v.c.

Foster Transformers & Switchgear, Ltd., South Wimbledon, London, S.W.19.—Priced leaflet on the 30A range of "H.I." fuse switches.

London Fan & Motor Co., Ltd., 91a, Burghley Road, Tufnell Park, London, N.W.5.—Priced leaflet introducing the "Cadet" light exhaust fan for free air only.

PARLIAMENTARY NEWS

From Our Special Reporter

REPLYING to a question by Mr. Gammans in the House of Commons last week, Mr. Robens, Parliamentary Secretary, Ministry of Fuel and Power, said he understood that experiments were being made in the use of ripple injection both for giving warning of power cuts and for shedding part of the load.

Publicity Co-ordination Committee

In answer to Mr. Boyd-Carpenter and Mr. Nabarro, Mr. Robens said that the Minister did not think it would be appropriate for him either to publicize the proceedings of the Fuel and Power Publicity Co-ordination Committee or to indicate in answer to Parliamentary questions the nature of the advice given by the Committee on particular issues either to the Ministry or to the gas and electricity industries : nor did he think it would serve any useful purpose to add to the membership of the Committee in the way suggested (representation of industrial and domestic fuel consumer interests).

Hydro-Electric Development

Mr. Robens informed Mr. Morley that about 1,500 million kWh was produced in Great Britain from water-power in 1950, an increase of 25 per cent on 1949. The greater part of this output came from the hydro-electric stations in Scotland and North Wales. It was often alleged that our river power could be used without the construction of large works ; when such plans had been examined by his Department they had been found impracticable.

Asked if the Minister would press on with these schemes wherever possible so that coal might be saved, Mr. Robens said that the policy was to use water-power to the greatest possible extent.

Scottish Fisheries

Lord Malcolm Douglas-Hamilton asked the Secretary of State for Scotland how many fishings were owned by the North of Scotland Hydro-Electric Board.

Miss Herbison said that the only fishings of any consequence owned by the Board were the Brahan and Scatwell fishings on the River Conon and the fishings at Invergarry. The Board also owned fishing rights in Loch Faskally, the new reservoir at Pitlochry, and six minor fishings.

Continuous Room Heating

Replying to Mr. Pitman, the Lord President of the Council, Mr. Herbert Morrison, gave details of the latest information available to the Department of Scientific and Industrial Research on efficiencies of various types of modern domestic heating appliances. It was, of course, impossible to give one figure for each type of appliance that represented the diverse advantages and disadvantages of the different methods of heating, and the overall efficiency of the continuous heating of a house with an internal flue depended on a number of factors.

The table was based on published figures for the efficiency with which gas, coke and electricity were produced from coal, and on experimental results obtained at the Building Research and Fuel Research Stations of the D.S.I.R. for the efficiency of modern appliances in the house. The final figures must, however,

	COAL (in closeable open fire)	COKE (in closeable open fire)		GAS (in convector fire)		ELECTRICITY
		(1)	(2)	(1)	(2)	
(*a*) Percentage of potential heat in original coal available at appliance	100	73 (3)	100	73 (3)	48 (3)	20 (3)
(*b*) Efficiency of good modern appliance, i.e., percentage of (*a*) delivered as effective heat (including heat gained from flue)	50–60	60–70	60–70	60–70	60–70	100
(*c*) Overall efficiency (%) with which potential heat in original coal is delivered as effective heat (*a*) × (*b*)	50–60	44–51	60–70	44–51	29–34	20

(1) The figures in these columns are based on the convention that gas and coke are both produced with the same efficiency. (2) In these columns the alternative convention has been adopted of debiting the whole of the heat loss at the gasworks to gas and assuming that the coke is produced with 100 per cent efficiency. (3) Averages for the whole country. The figures will become appreciably higher as installation of the most modern types of gasworks and power stations progresses. The figures for coke and gas are taken from the report of the Heating and Ventilating Committee and relate to 1937. The figure for electricity is taken from the Report of the B.E.A. for 1949–50.

be treated with reserve, since the types of fuel used in power stations were not generally suitable for direct domestic use, and since the amount of heat derived from the appliances depended, with solid fuel appliances, on their type, on the skill with which they were used, and on the grade of fuel employed and, with both gas and solid fuel appliances, on the rate of air flow up the flue. The figures applied only to continuous room heating, and, of course, took no account of convenience, cleanliness or other amenities; nor did they reflect the relative net costs to the consumer, which were affected by many other factors.

It was the view of the Minister of Fuel and Power that, in the present circumstances, it was not desirable that electricity should be used for continuous room heating.

Warnings of Power Cuts

Sir Wavell Wakefield asked the Postmaster General what action was being taken by the British Broadcasting Corporation to co-operate with the British Electricity Authority in giving warning to consumers to reduce electricity consumption to minimize electricity cuts and in warning consumers that a cut was about to be made.

Mr. Ness Edwards said that this was a matter for the B.B.C. but he understood that warnings of impending cuts over large areas were frequently broadcast already. Methods of helping the public in this matter were constantly under discussion between the B.B.C. and the British Electricity Authority.

Uganda Electricity Board

Mr. Parker asked the Secretary of State for the Colonies whether he would define the relationship between the Government of Uganda and the Uganda Electricity Board; and, in particular, what provision was made for African representation on the Electricity Board.

Mr. Griffiths said that the Board was appointed by the Governor in Council and had statutory powers and duties which were defined in the Uganda Electricity Board Ordinance, 1947. Members were appointed for their personal qualifications for the work and not to represent particular interests. The second part of the question, therefore, did not arise.

Sulphur Supplies

In reply to Mr. Kaberry, Mr. Hervey Rhodes said that there was no likelihood of the present allocation of sulphur being increased in the near future unless considerably larger supplies than at present could be secured from the United States, and representations had been made to the United States Government about the effects on the United Kingdom economy of the present shortages. Statutory control had been instituted over sulphur and sulphuric acid, and under that control arrangements would be made to see that, so far as possible, necessary rearmament needs were met.

During the debate on defence and rearmament Mr. Gaitskell, the Chancellor of the Exchequer, referring to the supply of raw materials, spoke about the shortage of sulphur. He said that last December the American Government instituted export control for sulphur in order to conserve their resources. The first allocations under this scheme for the first quarter of 1951 were made only just before Christmas. The allocation made to the United Kingdom involved a cut of 25 per cent on the already reduced rate of consumption in force during the latter half of 1950 and on that planned for the present year.

If we could obtain no increase in supplies, he must tell the House that we faced very serious consequences in a number of essential industries. The Government had encouraged the erection of new sulphuric acid plants, using other materials such as pyrites and the conversion of existing sulphur burning plants. But this must necessarily take time and satisfactory results could not be expected within two years. He could only hope that as a result of the meeting of the committee in Washington it would be found possible to release to us, for the time being and until alternative methods of production of sulphuric acid were available, a larger export allocation from the United States.

Volta River Scheme

Mr. J. Grimston asked the Secretary of State for the Colonies if he would make a statement on the proposal to establish a hydro-electric plant and an aluminium reduction works on the Volta River in the Gold Coast.

Mr. Griffiths said that the project was at present under investigation but he was not yet in a position to make any statement on it.

Codes of Practice

THE fourth report of the Codes of Practice Council, Ministry of Works, concerned with the construction of buildings and engineering services therein, covers the three years 1947–49. It reviews the organization and changes which have occurred, such as the removal of the civil engineering and public works Codes from the programme, reduction of the number of Codes and modification of drafting procedure to accelerate production. The number of Codes published by the end of 1949 in final form was 45 while 148 had been issued for comment. Some of the ways in which the work of the Council is made known are mentioned ; lists of members of the Council and its various committees are included. The report is obtainable from H.M. Stationery Office, price 1s.

A.C. Winders

New System of Motor Control and Dynamic Braking

FOUR 4,200 h.p. a.c. winders now being installed for the Free State Development and Investment Corporation of South Africa incorporate a new system of motor control and dynamic braking developed by the General Electric Co., Ltd. The motor driving a mine hoist is usually a slipring induction machine with the stator connected to a three-phase supply through one or two three-pole reversing contactors according to whether forward or reverse winding is required. The current and torque are limited by a variable resistance in the rotor circuit. For dynamic braking, a double-pole contactor applies d.c. to the two-phase terminals of the stator, the rotor resistance being used as a variable load.

During motoring, the control of rotor resistance presents no difficulty, but the new system provides that the value of the resistance shall always be such as to give the most economical operation. The main problems are with dynamic braking, a particular difficulty being to reconcile apparently conflicting conditions in the relationship between the stator d.c. excitation and the rotor resistance. This has been achieved in such a manner that d.c. excitation is automatically restricted at the low speeds required for rope and shaft inspection without forfeiting the braking power normally needed at such speeds. This reduction of excitation is necessary because the reduced ventilation on a prolonged run at low speed would lead to excessive heating of the machine. The control of both d.c. excitation and rotor resistance has been combined so that the response to the driver's lever is quite definite. In no case can torque decrease when it should increase with increasing travel of the lever and vice versa. Both when driving or when reverse power braking is being used, the method of control allows maximum permissible acceleration or deceleration under any condition of load.

Fig. 1 shows that the maximum torque of an induction motor is always the same and does not vary with different rotor resistances. In operation, the unstable part of the curve (dotted) must be avoided because the torque decreases here with increasing slip, and a reduction in rotor resistance leads to a reduced torque.

It can be shown that for every value of d.c. excitation current applied for dynamic braking, there is a definite ratio between rotor resistance and speed which will give a constant and optimum torque that is independent of speed. Furthermore, the torque of the machine when operating as a motor will be constant and independent of the speed if, during motoring, the rotor resistance is varied in constant proportion to the slip.

These results provide the solution to the problem of controlling the motor both when it is driving and when dynamic braking is

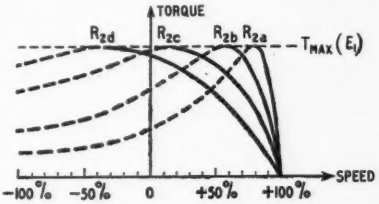


Fig. 1.—Induction motor characteristics with fixed rotor resistances increasing in the order R_{2a}, R_{2b}, etc.

applied. In the latter case the rotor resistance is automatically controlled to give maximum braking torque for any given value of excitation. This condition is satisfied by maintaining the correct relationship between the excitation current and the optimum ratio of rotor resistance to speed. In these circumstances there is a minimum dissipation of energy in the form of heat. Furthermore, operation at, or near, maximum torque minimizes the effect of the relatively coarse steps of resistance in contactor controlled grid resistors, or of the variation of resistivity of the fluid in

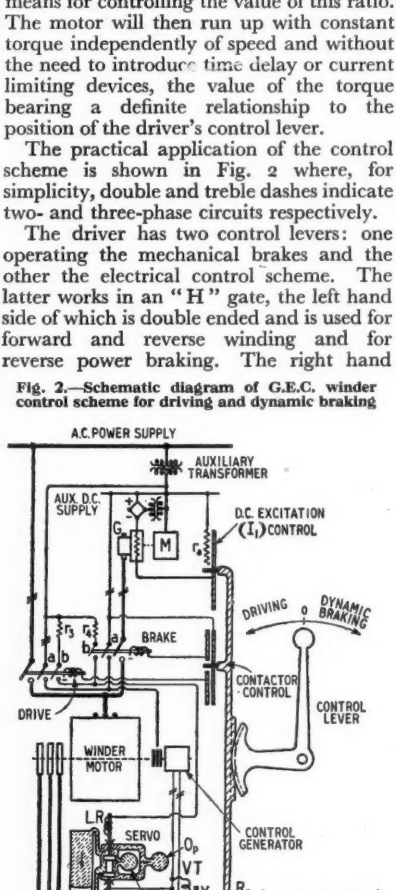
liquid controllers. Braking torque varies very little between consecutive resistance steps, but is steadily controllable by the d.c. excitation which is varied smoothly so as to give very fine and accurate control of braking.

When the motor is driving, or when reverse power braking is employed, it is necessary only to keep the rotor resistance at a fixed ratio to the slip and to provide means for controlling the value of this ratio. The motor will then run up with constant torque independently of speed and without the need to introduce time delay or current limiting devices, the value of the torque bearing a definite relationship to the position of the driver's control lever.

The practical application of the control scheme is shown in Fig. 2 where, for simplicity, double and treble dashes indicate two- and three-phase circuits respectively.

The driver has two control levers: one operating the mechanical brakes and the other the electrical control scheme. The latter works in an "H" gate, the left hand side of which is double ended and is used for forward and reverse winding and for reverse power braking. The right hand side is single ended and is used to apply dynamic braking. In the neutral position the lever is vertical and all power is switched off.

Fig. 2.—Schematic diagram of G.E.C. winder control scheme for driving and dynamic braking



When the control lever is moved to the left it connects the motor stator to the a.c. supply. At the same time the sliprings of a small 3/2 phase control generator are connected to a l.v. supply provided by an auxiliary transformer.

The control generator has a two-phase stator and a three-phase rotor mechanically coupled to the winder motor. The voltage induced in the stator will be proportional to the slip of the winder motor and it energizes the voltage transformer, VT, the tapping ratio of which is altered by the main control lever. The tapped voltage feeds one of the control coils, RR, of an electro-magnetically operated oil servo through a variable resistance r_1. When the "Raise Resistance" (RR) coil is energized the servo tends to raise the main rotor resistance R_2 and r_1 which are controlled in unison. Whenever the valve is under the influence of its own weight only it will also raise both resistances to maximum value, so that when all control excitation is off R_2 will be at maximum.

The other control coil, LR, is fed from the auxiliary transformer to produce a constant pull on the servo valve tending to lower R_2 and r_1. When the servo is in operation the position of equilibrium at which the piston will come to rest will be that at which the pulls of the two opposing coils LR and RR are equal. But since the current in LR is constant, the current in RR at equilibrium must always be the same, that is r_1 must be proportional to the induced voltage of the control generator, or proportional to the slip. By a suitable choice of resistances in the circuit, the resistance R_2 will also be proportional to the slip, which is the condition for constant driving torque independent of motor speed.

When starting a wind, the control lever is in the neutral position, R_2 is all in and the voltage induced in the control generator is the maximum. When the lever is moved, full voltage is applied to RR, which holds the rotor resistance at its highest value. Further movement alters the tapping on the voltage transformer, VT, reduces the voltage applied to RR so that LR takes charge and lowers R_2 to correspond with the torque represented by the lever position. This continues until starting torque is

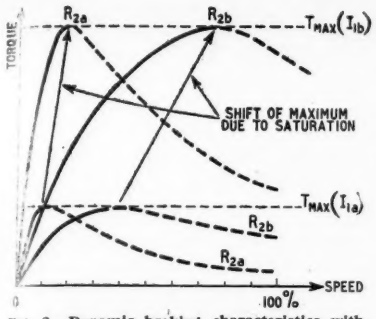


Fig. 3.—Dynamic braking characteristics with constant d.c. excitation and constant resistance R_2

reached and the motor begins to revolve. Thereafter the rotor resistance decreases automatically, due to the decrease in the induced voltage of the control generator with increasing speed, until it reaches its minimum value and the motor approaches synchronous speed.

The torque/speed curves for different values of rotor resistance at constant d.c. excitation are shown in Fig. 3 and here again the unstable (dotted) portions should be avoided.

To apply dynamic braking, the control lever is moved to the right, connecting the winder motor stator to the d.c. generator of the m.g. set. The field current of the generator is directly controlled by the lever through r_3. The control generator is also excited with d.c. through two of its slip-rings and hence acts as an ordinary d.c. excited alternator, the voltage at the stator terminals being proportional to the speed of the winder motor. RR is energized by this voltage through VT which is controlled by the lever as before, the tapping ratio varying with the d.c. applied to the winder motor to satisfy the optimum relationship between this and the ratio of rotor resistance and speed.

If the driver decides to apply dynamic braking when the motor is running at full speed, he must first move his control lever back to the neutral position thereby inserting resistance in the rotor circuit. Moving the lever on into the dynamic braking position will cause the contactors to operate and apply d.c. to the stator of the driving motor and to the rotor of the control generator. If R_2 and r_1 are all in, the current in RR will not be enough to overcome the pull of LR which will consequently operate so as to reduce the resistance in the rotor circuit. The simultaneous reduction of r_1 will now increase the current in RR until it balances the pull of LR. The rotor resistance will then be at its optimum value in relation to the d.c. excitation and the momentary speed of the winder motor. The falling speed of the winder motor, due to the braking effort, will now reduce the voltage applied to RR, and LR will take control and lower resistance to maintain the desired braking effort independently of speed.

Any braking effort up to the maximum is obtainable by moving the driver's lever, its position being always a measure of the braking torque applied. The control system automatically holds the rotor resistance at its optimum value thus ensuring stable operation as well as the lowest possible current in both the stator and rotor windings and hence minimum losses and heating.

In addition to the advantages of this system already mentioned the maximum permissible torque can never be exceeded no matter how the lever is operated.

Faraday Lecture

Lamps and Lighting

THE free public Faraday Lecture, which is organized every year by the Institution of Electrical Engineers, was delivered in the Central Hall, Westminster last week by Mr. L. J. Davies, director of research and education, British Thomson-Houston Co., Ltd.

The lecture comprised a record of the industrial research concerned with the development of lamps and lighting techniques, and was presented in an interesting and non-technical manner so as to be easily understood by the laity. In fact, it was almost a running commentary on a series of demonstrations illustrating the story of illumination, how it is obtained and how it is used.

Mr. Davies began by explaining the various ways in which light can be produced, such as by raising bodies to incandescence, by electrical discharges through gases and by fluorescence. He then described in detail the various types of incandescent filament lamps in common use to-day, after which he proceeded to deal with arc discharge light sources and fluorescent lamps, making a comparison of their efficiencies and colour rendering properties.

In conclusion, he dealt with particular applications of light sources such as for mines lighting, street lighting, photography and stroboscopy.

European Power Stations

Technical O.E.E.C.—E.R.P. Publication

COMPARISONS between modern power station equipment in Europe and the U.S.A. are drawn in "Note on the Technical Development of Thermal Power Stations," published by the Organisation for European Economic Co-operation (E.R.P. Information Office, Treasury Chambers, Great George Street, London, S.W.1).

The average percentage allocation of the costs of producing electricity is given as: fuel, 40; transport and handling of fuel, 5; ash disposal, 1; maintenance, 4; salaries and wages, 2; interest and depreciation, 48.

Characteristics of generating sets are chosen with the aim of reducing specific heat consumption, having regard to capital expenditure and load factor, and to their position on the network and loading, i.e., whether base load or intermittent. Efficiency and power-weight ratio are being improved by adopting higher steam pressures and temperatures as a result of research into high temperature alloys, the characteristics of which are usually very similar to those in the United States.

Trends in Design

Superheater tubes, steam valves and turbine blades are especially subject to the severest temperatures and this aspect determines the steam temperature at the turbine inlet. Last year the International Electricity Committee standardized sets of 100 MW for steam at 1,250 lb/sq in and 968 deg F and sets of 40 to 50 MW for 915 lb and 900 to 935 deg. The reheat cycle is not so attractive economically as it is in the United States because of the difference between the shapes of the load curves, but it is estimated to improve efficiency by 2 to 3 per cent and in some cases by 4·5 per cent. Out of 119 MW of gas turbines installed for all purposes in both hemispheres, 107 MW was made in Europe, where more than 300 MW is now under construction. Hydrogen cooling is being adopted for alternators of 50 MW and above, compared with 20 MW as a minimum in the United States, where the prevalent higher windage losses at 3,600 r.p.m., compared with 3,000 r.p.m. in Europe, offset the increased cost.

Boilers are the most expensive components of a power station, both in capital cost and in maintenance. The future tendency in Europe as in the U.S.A. will be to associate a single boiler, not interconnected with others, with each turbo-alternator, thus saving 10 to 15 per cent of the capital cost incurred with duplicate boilers of half rating. Boiler capacities have not hitherto exceeded 500,000 lb/hr, but units of 900,000 lb/hr of American design are to be manufactured in France. Europe differs from the U.S.A. in that low grade coal with high ash content is burned.

Recent Installations

New turbo-alternators in France include two of 100 MW (one of American and one of French manufacture) at Gennevilliers power station, near Paris, operating with steam at 1,260 lb/sq in and 970 deg F. Each is served by three 500,000 lb/hr boilers. Designed full load heat consumption is 8,660 B.Th.U/kWh. In Germany, the Herstein power station, near Dortmund, contains an 18 MW topping set supplied with steam at 1,700 lb/sq in and 920 deg F by two 270,000 lb/hr boilers. Its exhaust, reheated at 310 lb/sq in from 550 to 760 deg F, is taken to a 42 MW turbine. Another topping turbine of 20 MW, with similar initial and reheat steam conditions, is installed at Osthannover station, near Luneberg; the low-pressure component is rated at 48 MW and the associated boilers are four 250,000 lb/hr Benson units.

German manufacturers are said to have completed designs for 100 MW turbines and hydrogen-cooled alternators up to 150 MVA and to be constructing boilers for 1,010 deg F. The most notable Swiss product is a 110 MW single-axis machine with four-flow exhaust for 1,250 lb/sq in and 970 deg F with hydrogen-cooled alternator for the Grossbliederstroff power station in Lorraine. The largest new sets in Belgium are of 50 MW. For a projected station in Sweden 100 MW sets are contemplated.

Manufacturers' Activities—IX

Switchgear at Home and Abroad

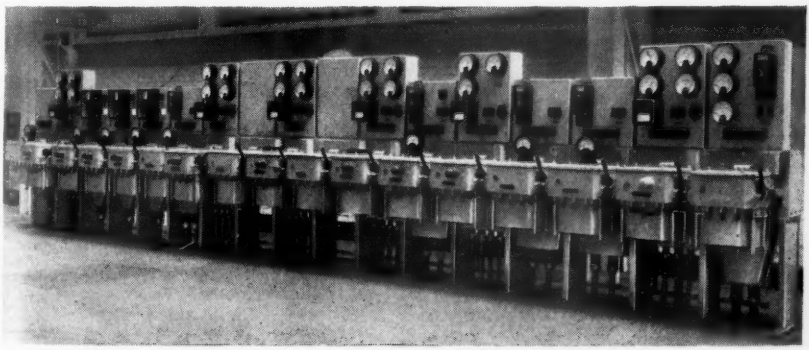
THE year just ended marked another milestone in the progress of Ferguson, Pailin, Ltd. Adjacent to the Bromborough power station of the Merseyside and North Wales Division a 12-switch, 132 kV 2,500 MVA substation has been commissioned and, pending completion of the generating plant, is being used as a grid tapping point to reinforce the 33 kV distribution in that area. Site work is being carried out on a 132 kV 2,500 MVA grid substation at Hinksford where the company has also commissioned both the 33 kV 500 MVA, seven-panel gear and a two-phase 7 kV, 13-panel switchboard. Remote control of all the equipment is carried out from a central room which houses all the control and relay panels, busbar protection equipment and ancillary apparatus.

At Barrow Main (the first 132 kV 1,500 MVA substation of the late Central Electricity Board to be equipped with air-blast switchgear) extensions are being carried out and the switchgear is in course of manufacture; 132 kV air-blast gear is also in production for the Carmarthen Bay power station in the South Wales Division, comprising twelve 2,500 MVA "Duo Blast" breakers and ancillary equipment of the indoor type.

Equipment is in hand for a complete outdoor switching station at Barrow Roosecote consisting of nine 2,500 MVA bulk-oil breakers to control the output from the solidly coupled 11/132 kV generator transformers in the adjacent power station. For a number of 33 kV outdoor substations, oil breakers of 350 MVA to 750 MVA are also in hand, including a 6-switch station for Sowerby Bridge, an 8-switch station for Penrith and an 11-switch station for Redhouse.

Power station main and auxiliary switchgear was also prominent in last year's programme. The installation of two 30-panel and one 22-panel auxiliary boards is proceeding at Bankside (London Division) together with extensions to the 33 kV generation and distribution switchboards at Kingston-upon-Thames. A 33 kV 750 MVA, 10-panel duplicate busbar transfer breaker switchboard is in production for the East Yelland power station (South Western Division) and a 6·6 kV 250 MVA, 9-panel generator switchboard with remote control facilities has been ordered by the Slough Trading Estates, Ltd., to replace the existing switchgear and also cater for the extensions which are at present taking place. Extensions at the Northampton power station will need 33 kV 1,500 MVA indoor heavy metalclad gear and a new control room will be equipped there.

General view of "K" switchboard at the Rogerstone factory of the Northern Aluminium Co., Ltd.



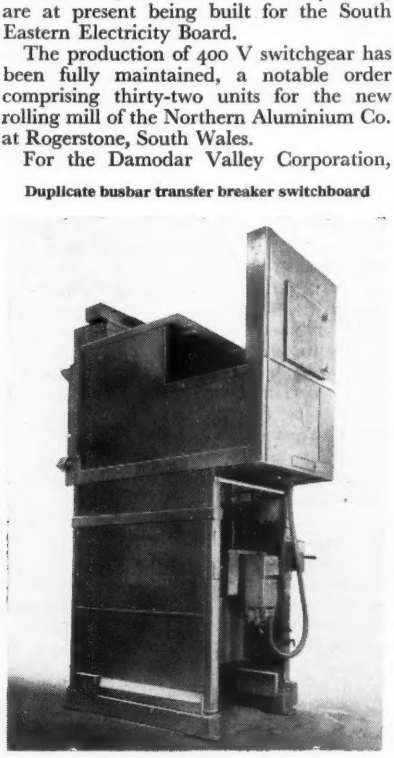
Equipment for substations included over thirty 22 kV 350 MVA units for North Hyde, fourteen for Southall and fourteen for the North Thames Gas Board.

At the Stanlow plant of the Shell Refining & Marketing Co., Ltd., sixty type BV units were commissioned and two other large switchboards, one of over twenty units, are at present being built for the South Eastern Electricity Board.

The production of 400 V switchgear has been fully maintained, a notable order comprising thirty-two units for the new rolling mill of the Northern Aluminium Co. at Rogerstone, South Wales.

For the Damodar Valley Corporation, India, the production is proceeding of twenty-one 132 kV 2,500 MVA outdoor bulk-oil breakers. Other contributions to that territory include six outdoor 22 kV substations for the Government of Bombay (South Gujarat) scheme, employing thirteen 250 MVA oil breakers and twenty-one outdoor cubicles for 11 kV service. Further outdoor 33 kV and 66 kV oil breakers, together with substantial quantities of air-insulated metalclad switchgear, are going to Provincial Governments and industrial consumers in India.

Duplicate busbar transfer breaker switchboard



Twelve indoor metalclad, 20 kV 750 MVA units will be housed in two substations for the City of Johannesburg, South Africa. Steady delivery progress has been maintained of indoor cellular mounting oil breakers for 20 to 40 kV up to 750 MVA, primarily for the Rand and Anglo-American undertakings. Progress has been maintained with 33 kV heavy metalclad switchgear orders for the Electricity Supply Commission of South Africa, and large quantities have been delivered for various South African and Rhodesian municipalities and mines.

The modern " streamlining " tendency in design has been acknowledged by Australia and is exemplified by orders totalling over 250 flush-fronted BV units, delivery of which will shortly commence, to be installed by the State Electricity Commission, Victoria, for the Morwell and Yallourn schemes, and by the Melbourne City Council.

A large order from the Belgian Congo has been executed during a relatively short period for urgent supplies at 10 kV for agricultural development. Distribution gear also went to the Kuala Lumpur area of Malaya and to Gibraltar, following the commissioning of a new power station in which similar metalclad switchgear has been installed.

Power Transformer Production

EXTENSIONS to the Empire Works, Dewsbury, and the installation of additional manufacturing equipment, have improved the facilities of the Yorkshire Electric Transformer Co., Ltd., for the production of power transformers up to and exceeding 45 MVA, 132 kV.

The installation of a 12,500 kW English Electric alternator, high-voltage testing plant and other equipment, will provide facilities for proving the larger sizes of transformer now manufactured. Vacuum drying oil impregnating plant and additional cranes have also been provided.

Contracts completed during the past year include 15 MVA and 10 MVA transformers with on-load tap changing equipment for various Divisions of the

British Electricity Authority. Contracts are now in hand for 15 MVA units for the London Division, 10 MVA, 66 kV and 33 kV units for the North Eastern and North Western Areas and several units for the North of Scotland Hydro-Electric Board's Clachan and Grudie Bridge schemes.

Four 20 MVA, 33/11 kV "ON" transformers with on-load tap changing equipment for the Midlands Electricity Board are included in the extensive programme the company has in hand for Electricity Boards; others include numerous 15 MVA and 10 MVA sizes for the Yorkshire, North Western and South Western Electricity Boards.

New test bay extension showing a 20 MVA 33/11 kV "ON" transformer for the Midlands Electricity Board in the background with a 5 MVA 33/11 kV "ON" transformer for a Ministry of Supply establishment in front

Increased export sales to almost every country in the world include units up to 20 MVA and voltages up to 110 kV for Scandinavia and the European countries, and 5 MVA, 7·5 MVA and 10 MVA units, 33 kV and 66 kV, for India, New Zealand and South Africa.

The company has its own tank fabricating section which is capable of manufacturing tanks and radiators for all sizes of transformers, thus ensuring co-ordination of production and delivery to meet requirements.

AUSTRALIAN NOTES

RECENTLY Mr. J. O. Cramer urged the Federal Government to assist small firms to install small electric power generating plants "to help them overcome the critical power position." Mr. Cramer said that it was scandalous that millions of pounds worth of production should be lost because of the power position. In Victoria electricity cuts have been introduced five days weekly.

Since the Commonwealth Government passed the Snowy Mountains Hydro-Electric Power Act in July, 1949, much work of a preliminary nature has been carried out. The scheme is designed to produce power progressively, and it is expected that the first power—approximately 60,000 kW—will be available within four to five years. The work involves the erection of sixteen power stations, the cost being estimated at £225 million. The technical committee investigating the economic value of the scheme estimates that the cost of production, including transmission, will be £9,400,000 per year less than the cost of similar power from the most modern type of thermal station.

Ownership of the Newport power station, Victoria, has now been transferred from the Victorian Railways to the State Electricity Commission. The transfer is the culmination of more then two years' negotiations.

The new power station at South Fremantle is steadily taking shape. The first 25,000 kW turbo-alternator has been assembled but part of the condensing plant has to be finished. Foundations for the "B" station are complete and about one-third of the steel work has been erected. All towers to Perth have been completed.

E.T.U. Residential College

The *Malden Clarion* reports that the Electrical Trades Union is considering the establishment of a residential college for its members in "Coombe Ridge House," George Road, Coombe. Malden Council has raised no objection on the grounds of town planning.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Cable & Wireless (Holding), Ltd., in a preliminary statement, reports a group profit for 1950 of £882,000 as compared with £2,953,000 for 1949. The 1949 balance included £838,000 from previous years, while the 1950 credit was only £43,000. Taxation requires £405,000 (against £1,629,000), and the net profit is £477,000 (against £1,324,000). The Holding Co.'s profit is £458,000 (against £1,285,000. It is proposed to pay an ordinary dividend of 6 per cent (against 4 per cent for the previous year). The dividend is payable on £5 million ordinary, as compared with £6,883,103 in the previous year, when the £16,766,591 5½ per cent preference were either repaid or converted.

The Westinghouse Brake & Signal Co., Ltd., in declaring an unchanged dividend of 14 per cent for 1949-50, reports group trading profits of £482,881 (against £491,213 for 1948-49) after meeting depreciation. After providing for interest on overdrafts and taxation, the group net profit is £228,462 (against £224,428). The net profit of the parent company is £167,969 (£171,932) and after adjustments and adding £99,651 brought in a sum of £284,535 is available. Of this £60,000 is transferred to reserve, £40,000 to tax reserve and after meeting the dividend £98,112 is carried forward.

Clarke, Chapman & Co., Ltd., in a preliminary statement, show a net profit for 1950, after all charges, including tax, of £178,508, as compared with £172,098 for 1949. Reserve for replacement of fixed assets receives £40,000, and deferred repairs and rehabilitation expenditure £23,736. The ordinary dividend for the year is 15 per cent, less tax (against 12½ per cent).

Taylor, Tunnicliff (Electrical Industries), Ltd., reports a profit for 1950, after deducting taxation and depreciation, of £136,677, as compared with £123,428. It is proposed to pay a dividend for the year of 20 per cent, less tax (against 15 per cent).

Richardsons, Westgarth & Co., Ltd., is holding a meeting of shareholders on 13th March to obtain approval for an increase in the authorized capital from £1,120,000 to £1,600,000. Subject to the consent of the Capital Issues Committee, the directors propose to issue new capital.

Falk, Stadelmann & Co., Ltd., are placing privately £100,000 of 4¼ per cent unsecured loan stock. They also propose to offer to present shareholders 50,000 7 per cent cumulative preference shares of £1 at 25s per share and 57,750 ordinary £1 shares at 35s. A meeting has been called for 5th March to consider a resolution for raising the authorized capital to £1,250,000 by the creation of 150,000 ordinary shares.

The Direct Spanish Telegraph Co., Ltd., reports a net profit for 1950 of £4,057, as compared with £4,008 for 1949. The ordinary dividend for the year is unchanged at 4½ per cent.

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., is again paying a dividend of 9 per cent.

New Companies

Meadway Electrical Supplies, Ltd.—Registered 10th February. Capital £1,000. Electrical engineers, etc. Directors : Marie R. Key and Edith M. Key. Regd. office : 128, Albany Street, N.W.1.

Power Controls, Ltd.—Registered 10th February. Capital £25,000. Manufacturers, importers and exporters of and dealers in precision electro-mechanical products, power control components, etc. Subscribers : P. M. Threlfall and J. W. Dalgleish. Solicitors : Few & Kester, Cambridge.

A. E. Ratcliffe, Ltd.—Registered 12th February. Capital £3,000. To acquire the business of an electrical and wireless engineer carried on by A. E. Ratcliffe, at 93b, Walsworth Road, Hitchin, Herts. Directors : A. E. Ratcliffe and Mrs. Grace E. Ratcliffe. Regd. office : 93b, Walsworth Road, Hitchin.

Geraghty Products, Ltd.—Registered 13th February. Capital £1,000. Coil winders, electrical engineers, electrical installation contractors, etc. Directors : J. E. Geraghty and J. Donnellan. Regd. office : 153, High Road, Chiswick, W.4.

Increases of Capital

Aurora Lamps, Ltd.—Increased by £16,000, in £1 ordinary shares, beyond the registered capital of £25,000.

British National Electrics, Ltd.—Increased by £16,000, in £1 ordinary shares, beyond the registered capital of £100,000.

Brentford Transformers, Ltd.—Increased by £19,980, in 1s ordinary shares, beyond the registered capital of £10,020. The capital has been reorganized and is now £20,000 in 5s ordinary shares.

Meeting of Creditors

Southern Electric Equipment Co. (Hove), Ltd.—Meeting of creditors on 26th February at the offices of A. E. Orbell & Co., 7, Old Steine, Brighton.

Receivers Released

Brandenberg Designs, Ltd.—A. A. Lowe, of 19a, Coleman Street, E.C.2, ceased to act as receiver and/or manager on 15th January, 1951.

A. M. E. Sherwood, Ltd.—H. A. Kellie, of The Old Rectory, Itchenor, near Chichester, Sussex, ceased to act as receiver and/or manager on 19th December, 1950.

Anson Lee, Ltd.—J. D. Russell, of 12/3, South Place, E.C.2, ceased to act as receiver on 1st February.

Bankruptcies

P. Thomas, 43 New Street, Ledbury, Hereford, and lately carrying on business at 4, New Street, Ledbury, radio and electrical engineer.—Receiving order made 10th February on debtor's own petition.

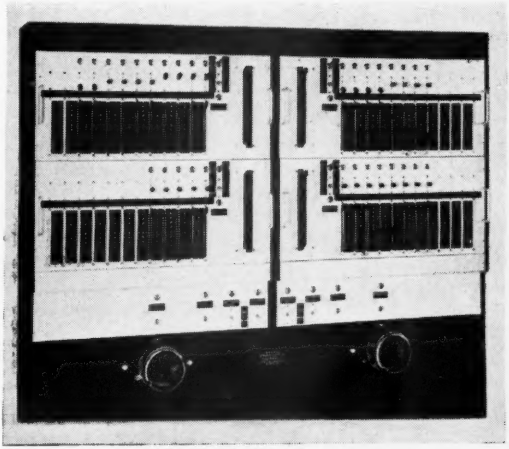
H. Gold (formerly Gelkop), 271, Evering Road, Clapton, radio and electrical engineer, trading as Radio & Electric Service, at 193, Mare Street, Hackney, and Goldway Electronics at 141, Park Road, St. John's Wood, N.W.8.—Last day for receiving proofs for dividend 5th March. Trustee, Mr. A. W. Hunter, 185-188, High Holborn, London, W.C.1.

A. Smith & J. Smith, formerly carrying on business in co-partnership at 550, Bolton Road, Pendlebury, Lancs, as J. & A. Smith, electrical contractors.—First and final dividend of 1s 5¾d in the £, payable at the Official Receiver's Office, 20, Byrom Street, Manchester.

Stage Lighting Control

SATURABLE choke dimming equipment is now being used to control the stage lighting at the Islington Town Hall, London. In conjunction with the Islington Borough Council, Stage Electrical Equipment, Ltd., which manufactured and installed this three-bank, 36-way "Miniseel" switchboard, recently gave a series of interesting demonstrations to show the diversity of effects that can be achieved by the use of the equipment and the ease of control which it affords. A four-bank, 48-way switchboard of the same type, which has been made for the drama section of Bristol University, was also shown.

In this system the electrical control has a ratio of 50 : 1 in power, which means that 50 kW of lighting can be controlled by one kW of d.c. on the control panel. By a system of two-way switching any one or a number of circuits can be thrown into bank master or grand master dimmers, thus allowing individual banks to be brightened or dimmed simultaneously. Individual circuits can also be pre-set at various points and brought up to their desired brilliance by operation of one of the masters. A similar method is used for dimming fluorescent lamps and the two forms of lighting can be controlled from the same panel.



Saturated choke stage-lighting control panel for Bristol University

STOCKS and SHARES

STOCK EXCHANGE markets remain active, and prices on the whole keep firm. Last week's issue of Steel Stock gave a fresh impetus to business in most departments of the House and the number of recorded bargains showed almost daily expansion. The effect upon markets outside the gilt-edged section was to bring in fresh buying orders. Industrial equity shares benefited noticeably at the expense of British Government and others in this group. British Electricity and London Transport stocks gave way with the rest. The weakness extended to Consols and War Loan. The liveliest market in the early part of the week was that for rubber shares, where a repetition of the old "Mad-Monday" scene revived many memories.

Cable & Wireless Dividend

A rise of 12½ points to 111½ in the price of Cable & Wireless (Holding) ordinary stock gives the measure of the satisfaction with which the market received the announcement of a 6 per cent dividend. This rate compares with the 5 per cent indicated, last May, by Sir Edward Wilshaw as the likely payment on the reconstructed capital. It is assumed that profits for 1950 will not have borne a full year's interest charges, and that the investments will have to be reduced over the next year or two in order to provide for repayment of the 3½ year loan stock. Nevertheless, market opinion takes the view that the Trust could not be starting life at a dividend rate which might later prove untenable in the ordinary course of events and that the yield on the ordinary stock can be calculated as about 5½ per cent on that basis.

Radio and Television

After opening last week at a premium of 7½d on the issue price of 20s 9d, the price of the Pye Company's new 5 per cent preference shares came back to 20s 3d under the pressure of selling by the quick-profit brigade. Shares will be available, free of stamp to the buyer, until the last date of renunciation by allottees a month hence. They show the useful yield of £4 18s 6d per cent, which compares well with that on others of equal calibre, and are thought likely to harden when the issue settles into more permanent hands. On reports of big defence contracts, ordinary shares in this section of the industrial market are inclined upwards. Pye deferred are up to 21s 6d, and Cossors are good at 12s 9d. Ekco rose to 19s 6d.

Week's Fluctuations

English Electric rose to 52s 6d, and amongst other improvements were Murex, 54s, Ever Ready, 29s 6d, Hoover, 29s 3d, Allen West, 11s and Marconi Marine, 28s 9d. Globe Telegraph ordinary advanced, in sympathy with the rise in Cable & Wireless to 22s 6d ex dividend. Perak River, 10s 6d, are 1s 6d up on the more settled conditions that seem to be developing in Malaya. Hall Telephone Accessories, 16s 6d, are 9d to the good. Chloride Electric hardened to 60s, British Insulated Callender's Cables to 36s, Ericssons to 46s 3d and Siemens to 33s 9d. Babcock & Wilcox are better at 70s. Plessey at 18s 9d are 1/16 up on the week.

Company News

Taylor Tunnicliff (Electrical Industries) 5s ordinary rose to 19s on the announcement of higher profits and an increase in the dividend to 20 per cent. This compares with 15 per cent paid in each of the previous three years, and is the best declaration since the company was registered in its present form just before the war. From the preliminary profit figures, it appears that the latest payment will leave the best part of £100,000 to be ploughed back into the business. The yield on the shares now works out at 5¼ per cent. Falk, Stadelmann & Co., are to offer their shareholders 50,000 of the company's 7 per cent preference at 25s, and 57,750 ordinary at 36s. In addition, £100,000 4¼ per cent unsecured loan stock is to be issued. The present ordinary shares stand in the market at 41s 3d.

Five Per Cent

Electrical Components new 5½ per cent preference shares, offered to holders last month at 21s, can be bought in the market at 6d above that figure, to pay a well-secured 5¼ per cent on the money. They can be obtained free of transfer stamp duty up to the 27th of this month. According to the company's statement, the amount of preference capital is covered nearly eight times by net tangible assets; and the dividend practically thirty times by profits of the year ended last March. Turnover is stated to have risen during the present year. Other preference shares offered on a 5 per cent yield basis include Siemens 10 per cents at 40s and Phoenix Telephone 5½ per cents at 21s 7½d.

Enfield Debentures

Enfield Cables new 4 per cent debentures, offered to stockholders at par, opened last week, against a weak gilt-edged background, at a premium of just under a point. Redeemable between 1961–76 at prices declining from 102 to 100, and offering nearly 4 per cent on the money with first-rate security, the stock commends itself to the attention of former holders of nationalized steel debentures. It will be transferable free of stamp until the middle of May. Interest on the issue is covered some eight times on the basis of the 1949 accounts.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Emergency Lighting Units

THE WASP ALARM CO., LTD., Chester Road, Stretford, Manchester, has produced a series of emergency lighting units under the name "Vespalite," all involving the same basic principle, i.e., that each is a container housing an accumulator, automatically float charged from the mains, and the necessary equipment to light the emergency lamps immediately the power supply fails and to extinguish them on resumption of supply. The charging equipment is designed so that the charging rate varies according to the state of charge of the battery.

Model 1, which is designed to operate two 24 W 6 V bulbs, is powered by a 6 V 60 A 10 Ah rate accumulator and is listed at £12 10s. Costing £6 more, Model 2 has a 12 V 60 A battery capable of handling double the output.

Model 3 (£21) a de luxe edition of model 1, is suitable where extension leads are not required and where appearance is a prime consideration. The battery is housed in an embellished case with a lamp house of modern design, and one 230 V 60 W lamp is permanently lighted from the mains.

A special hospital unit, model 10 (35 gns), is normally plugged into the mains. When the mains fail, or the plug is withdrawn for use away from the power point, the tray light automatically acts as a location lamp. The surgical lamp is adjustable to any desired position. A stationary unit, model 20, is capable of supplying 50 V for 120 Ah.

Display Turntable

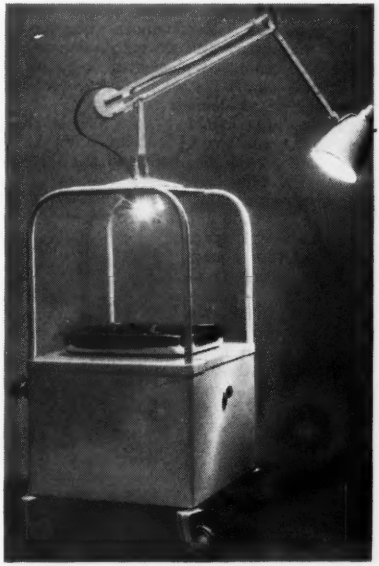
A turntable for window display is now being made by TIME SWITCHES & INSTRUMENTS, LTD., Bovey Tracey. Designed to carry 30lb, it is robustly constructed with cast aluminium top and base. The top is covered in pastel blue felt, the base being finished in cream. The high torque synchronous motor, which rotates the turntable at 3 r.p.m., takes only 3 W. The price is 77s.

Footwear Dryer

All types of footwear including Wellington boots, waders and sea boots, can, it is claimed, be safely dried and warmed by means of an electric device brought out by RONNING & Co., 7, York Place, Adelphi, London, W.C.2. The appliance consists of a pair of perforated metal "trees" each fitted with an 8 W element, the metal parts being earthed. Only one size is made but this is said to be suitable for all sized boots and shoes, including children's. The various colours available include green, red and

Ronning footwear dryer

"Vespalite" hospital emergency lighting unit



blue. The price is 26s 8d (plus 6s 8d purchase tax in this country).

Zirconium

The production of zirconium metal on a commercial scale has recently been initiated by MUREX, LTD., Rainham, Essex. Sheets down to 0·005in thickness, 6 to 7in wide and 2 to 3ft long are being made; rods down to 2mm diameter can be supplied. This metal resists most kinds of corrosion; it is a good "getter," is used as a grid emission inhibitor and can, in many cases, replace tantalum or molybdenum.

Multiple Spot Welding Equipment

The range of resistance welding equipment made by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2, has been supplemented by the introduction of electronically controlled multiple spot welders. A typical performance with an input of 250 kVA is 200 spot welds in 30 sec, using 12 cycles of welding time for each combination of points.

Unit Type Cooking Ranges

The "Creda Unity" cooking ranges just brought out by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham, are designed for building up into a bank of any number, either to form an island site in the centre of the kitchen or to be placed in a single line against a wall. When butted together they will be flush with one another and the hobs form a continuous run, cleaning being reduced to the minimum. Replacement costs are low and it is a simple matter to make extensions, reductions or replacements.

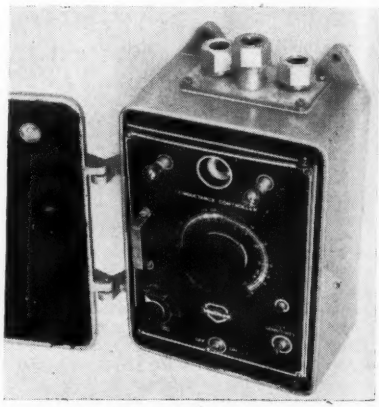
Two sizes are available. Both have two 4 kW 16in by 12in and two 1¼ kW 6in by 8in boiling plates and are 2ft 10in high and 2ft 4½in deep but the HC 4904 is 3ft 5½in wide and has a 24in cube oven cooking space loaded at 6·4 kW, while the HC 4906 is 6in narrower and has an oven cooking space measuring 18in square by 24in, loaded at 4·4 kW.

The oven elements are of the open coil radiant type, with automatic control. When the door is shut the oven is completely sealed except for the air which enters through a concealed ventilator. This intake of air is controlled. All boiling plates have pilot lights and are independently controlled by 3-heat switches or "Simmerstats" as desired. All electrical components are easily accessible from the front.

The hobs are of cast iron, the bodies being of heavy gauge sheet steel. The standard exterior finish is silver grey mottled vitreous enamel and the oven interior has blue mottled vitreous enamel. Alternative colours can be provided at a slight extra cost.

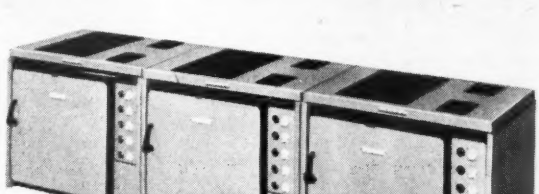
Conductivity Controller

The conductivity controller shown below is a convenient and sensitive means of controlling chemical or concentration changes in a variety of industrial processes. For example, it may be used for the automatic control of boiler water condensate, washing solutions, brine concentrations and the sodium hydroxide content in industrial solutions. It is available from MULLARD ELECTRONIC PRODUCTS, LTD., Century House, Shaftesbury Avenue, London, W.C.2.



Mullard conductivity controller

Bank of "Creda Unity" cooking ranges



ELECTRICITY SUPPLY

Generation in January

Extensions at Drakelow and Hackney

IN January the quantity of electricity generated at power stations controlled by the British Electricity Authority, the North of Scotland Hydro-Electric Board and the Lochaber Power Company rose to a new peak of 5,946 million kWh, the rate of increase (12·8 per cent) following fairly closely the average for the preceding twelve months. A point of note is the greater use made of oil as fuel, 11,100 tons being consumed compared with only 6,700 tons in January, 1950. In addition, more use was made of oil-engined plant, which generated 16·6 million kWh against 12 million in the corresponding month last year.

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water Power	Total*		
British Electricity Authority ..	3,411	9·5	5,746	44	5,805	5,489	14,571
North of Scotland	23	1·6	33	101	141	139	528
Total for January, 1951	3,434	11·1	5,779	145	5,946	5,628	15,099
Corresponding total for January, 1950	3,028	6·7	5,118	136	5,271	4,983	13,904
Increase, per cent	+13·4	+65·7	+12·9	+6·6	+12·8	+12·9	+8·6

* The total figure includes generation by oil engines amounting to 16·6 million kWh and waste heat plants amounting to 4·5 million kWh in January, 1951.

During the month new plant installed by the B.E.A. included a 200,000 lb/hr Mitchell boiler at Thornhill power station, a 190,000 lb/hr boiler of the same make at Neepsend and a 30,000 kW English Electric set at Llynfi.

Power Station Extensions

The British Electricity Authority has received the consent of the Minister of Fuel and Power to the extension of the new power station now under construction at Drakelow, in the East Midlands Division, and of the existing power station at Hackney, London. The authorizations provide for the installation at Drakelow of two further 60,000 kW turbo-alternator sets and two 515,000 lb/hr boilers and the installation at Hackney of two 30,000 kW sets, two 300,000 lb/hr boilers and one 2·25 million gal/hr cooling tower.

Niagara Project

Mr. R. H. Saunders, chairman of the Ontario Hydro-Electric Power Commission, recently gave figures indicating the size of the Commission's planned $157,000,000 power development project at Niagara Falls. He said that a cement-lined routing tunnel 45ft in diameter and 5½ miles in length would take water from above Horseshoe Falls to the whirlpool below the cataract. Work had started on a 2½-mile open-cut canal to carry the water from the whirlpool to the forebay of the generating station at Queenston, at the outlet of the Niagara River. The development would produce 600,000 h.p. by 1954. A 30-bed hospital and a cafeteria seating 600 persons would be built near three construction camps to be set up at Chippawa, Whirlpool Rapids and Queenston. A two-lane road would be built down the face of Niagara Gorge for the transport of materials to the construction sites, and this would be used later as a scenic drive for tourists.

Farmers and Power Cuts

The Cumberland and North Westmorland Branch of the National Farmers' Union has been informed by the North Western Electricity Board that, in future, farms with electric milking equipment will be last on the list for afternoon power cuts. Previously the Branch had pointed out the inconvenience suffered when the supply was cut off in the middle of the afternoon milking period.

Electricity in Mull

Under the North of Scotland Hydro-Electric Board's Constructional Scheme No. 57, which has been approved by the Secretary of State for Scotland and laid before Parliament, the former Ledaig Distillery building at Tobermory is now to be used as a generating station to deal with the growing demand for electricity in Mull. The existing small hydro-electric scheme on the Tobermory River will be extended and

hydro-electric and diesel plant with a combined capacity of 1,000 kW will be installed in the new generating station. The Scheme is estimated to cost £92,000.

Oldham Decision Referred Back

By 15 votes to 13 Oldham Town Council has referred back for reconsideration a proposal by the Housing Sub-Committee to install only gas fittings for washing and cooking in houses on the Fitton Hill estate. This decision of the committee had automatically rescinded an earlier resolution that 60 per cent of the houses built by the Corporation should have gas services and 40 per cent electrical.

Radio Sales

Leeds Chamber of Trade last week decided to protest to the Yorkshire Electricity Board against its trading in radio and television sets in competition with a firm long established in the same block of buildings. The complaint came from the firm which pointed out that, by an agreement in their lease with the Leeds Corporation, they were prevented from trading in competition with any other tenants.

Charges in the South West

Commenting on the announcement by the British Electricity Authority regarding the effect on electricity charges of the recent increase of 4s 2d per ton in the price of coal, the South Western Electricity Board stated last week that an additional £200,000 revenue would have to be found by the Board during 1951/52. Nearly £150,000 of this sum would have to come from domestic and commercial consumers and during the next few months the Board would have to revise all existing tariffs which did not include a cost-of-coal adjustment clause.

For improving the lighting at Chowpatty Seaface, a popular resort in Bombay, the municipality has installed fourteen G.E.C. "Three-Eighty" lanterns, each equipped with three "Osram" 5ft 80 W daylight fluorescent lamps

Italian Power Production

A programme for the construction of power plant which has been agreed between the Italian authorities and the Economic Co-operation Administration will increase production to 27,600 million kWh in 1950–51, 30,400 million in 1951–52 and 33,800 million in 1952–53 (91·1 per cent hydro-electric).

Voltage Improvement

Stanley (Co. Durham) Urban District Council has protested to the North Eastern Electricity Board about the poor voltage at Dipton, South Stanley and Crookgate. The Board, in reply, stated that a programme costing about £40,000 for work in the Stanley urban area had been approved and a further £50,000 was to be included in later estimates. It was expected that the voltage in the three areas mentioned would be improved within a short time.

Increased Charge for Power Points

Washington (Co. Durham) Urban District Council has decided to increase the standard charge to tenants of Council houses for the installation of 15 A power points from £2 2s 5d to £3 11s 6d and for 5 A power points from £1 17s 8d to £2 13s 6d.

Wiring Durham Houses

Durham City Council has applied to the Ministry of Health for sanction to carry out a £9,732 scheme for installing electricity in 336 houses. The cost will be recovered by increasing rents by a shilling a week.

Street Lighting

Blyth Lighting, Water and Transport Committee has asked the Town Council to approve the installation of 255 electric street lamps on traffic routes in the next three years. This is the first step of the Council's plans to improve the town's street lighting.

The Eastern Electricity Board has been asked to submit to March Urban District Council schemes for improved street lighting in the town.

Towcester Council is to proceed with a scheme for converting street lighting to electricity. It is proposed to have 42 fluorescent lamps in the Watling Street (subject to M.O.T. grant) and 66 100 W lamps in side roads.

Modern Kettle Production

Manufacture of the New "Creda" Model

OF equal interest to the novel design of the new "Creda" kettle produced by the Simplex Electric Co., Ltd. (see *Electrical Review*, 24th November, page 841), is the method of manufacture, which involves, among other things, the deep drawing of the body in one operation, special plating and polishing methods, and the use of a new automatic cut-out switch.

Production, which was initially fixed at 2,000 kettles a week but is now dependent on the raw materials situation, is being carried out in a section of the company's domestic appliance factory at Blythe Bridge. Operations start with the forming of the body from a circular copper blank in one draw by a 100 ton double action press. After trimming by a spinning process, the body goes to another press (30 ton) for the lid hole to be pierced. Meanwhile the

Above left: Bodies are stamped out in one draw operation at about 100 an hour

Above right: Polishing of the copper body is carried out automatically in four operations, one worker attending to all four machines

Right: General assembly of the kettles

bottom is blanked out from strip and the spout is formed from 4in squares of metal, while the lid, produced from circular blanks, is trimmed, planished and slit for the steam vent and knob.

Rough polishing of the body is carried out automatically in four operations. Fly-press operations make the holes for the element, spout and handle. After a dipping operation to remove any dirt, the spout, already electro-tinned, is brazed on, together with the bottom on which the studs for the legs have been welded.

Successive baths of caustic soda, hydrochloric acid, and hot and cold water render the surface of the kettle chemically clean preparatory to plating. A 10 second immersion in a copper plating vat is followed by treatment in a new type of continuous nickel plating vat. Here, with the aid of a special jig which enables a cathode to be placed inside the kettle, the inside and outside of the kettle are plated in one operation. The bright nickel solution used renders polishing unnecessary before the chromium plating of the exterior and tinning of the inside.

After final polishing and inspection the kettle is passed on to the assembly department, where the element, safety switch, moulded handle, feet and element shroud are fitted. Following a water test to detect leaks, the kettle is placed in an oven to dry out before packing.

The embedded type element, made in a separate department, after flash testing receives a time test to ensure that the cut-out operates in between 20 and 36 seconds.

(1) Chromium plating the body exterior. (2) Soldering the spout to the body. (3) Piercing the body to provide aperture for spout, lid and handle assembly. (4) Assembling the elements

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

1[illegible]18. Marconi's Wireless Telegraph Co., Ltd.—Resonant line circuit arrangements. 14th June, 1946. (651[illegible]09.)

1[illegible]710. Watton, W. L.—Signal channels having a wide band-pass especially for television receivers. 11th June, 194[illegible]. (651392.)

2[illegible]126. Soc. le Carbone-Lorraine.—Microphones. 10th September, 1946. (651452.)

27699. Submarine Signal Co.—Signalling system and apparatus. 16th September, 1946. (651453.)

34709. Poittevin, M.—X-ray tubes. 22nd November, 1946. (Cognate application 34710, 9th May, 1946.) (651455.)

35727. James, I. J. P.—Electrical resistors. 7th November, 1947. (651393.)

36930. Pye, Ltd., and Lawson, D. I.—Scanning circuits for cathode-ray apparatus and particularly for television apparatus. 13th December, 1947. (651456.)

1947

3712. Standard Telephones & Cables, Ltd., Hargreaves, T. F. S., and Gould, W. F.—Electric signalling systems. 6th February, 1948. (651457.)

4624. Henson, A. F.—Electron-discharge devices such as television transmission tubes. 7th February, 1948. (651395.)

5211. Sealey, E. J.—Electric indicator. 11th June, 1948. (651460.)

11605. Standard Telephones & Cables, Ltd., Hargreaves, T. F. S., and Gould, W. F.—A.c. signalling systems. 30th April, 1948. (651461.)

18161. Standard Telephones & Cables, Ltd., Terry, V. J., Hargreaves, T. F. S., and Gould, W. F.—Voice-frequency signalling receivers. 9th July, 1948. (651464.)

20728. Marconi's Wireless Telegraph Co., Ltd.—Winding coils. 31st July, 1947. (651399.)

21779. Western Electric Co., Inc.—Electrical signalling systems. 7th August, 1947. (651515.)

22327. Automatic Telephone & Electric Co., Ltd., and Rayner, T. B.—Electrical remote two-condition indicating systems. 23rd March, 1948. (651401.)

23097. Standard Telephones & Cables, Ltd.—Electron velocity modulation apparatus. 20th August, 1947. (651516.)

23972. Creed & Co., Ltd., and Salmon, R. D.—Printing telegraph apparatus. 29th October, 1948. (651470.)

29412. Svenska Turbinfabriks Aktiebolaget Ljungstrom.—Regulating mechanism for back-pressure or boiler-pressure regulated turbines. 4th November, 1947. (651471.)

29544. Electricité de France.—Recording cathode-ray oscillograph. 5th November, 1947. (651472.)

32153. Kalin, J.—Arrangement for regulating the voltage of a galvanic bath. 5th December, 1947. (651475.)

32292. Lewis-Shepard Co.—Electrically propelled hand trucks. 8th December 1947. (651476.)

32420. Philips Electrical, Ltd.—Thermionic valve circuits for deriving two equal voltages of opposite phase. 9th December, 1947. (651478.)

33384. Bayford, L. J. C.—Electron-discharge devices especially cathode-ray tubes. 18th December, 1948. (651518.)

1948

1396 and 2127. Western Electric Co., Inc.—Signalling systems. 16th and 23rd January, 1948. (651520/1.)

5598. Guardian Electric Manufacturing Co.—Spring clamping device suitable for securing an electric switch stack assembly. 25th February, 1948. (651647.)

5770. Barrett, E. L.—Radio antennae. 26th February, 1948. (651426.)

7909. Marconi Instruments, Ltd., and Willis, D. R.—Wheatstone bridge measuring circuit and automatic control circuit arrangements. 22nd February, 1949. (651431.)

8754. Standard Telephones & Cables, Ltd.—Chlorinated indan derivatives and process for making same. 25th March, 1948. (651528.)

12421. Marconi's Wireless Telegraph Co., Ltd., and Mortley, W. S.—Telegraph and like radio transmitters. 10th March, 1949. (651537.)

12644. Measurement, Ltd., and Hewlett, S. J.—Apparatus for transmitting to a remote point the indications of meters or other instruments. 7th April, 1949. (651538.)

13552. British Thomson-Houston Co., Ltd.—Organo-substituted polysiloxanes. 19th May, 1948. (651543.)

15012. British Thomson-Houston Co., Ltd.—Fixtures for grinding twist drill tips. 3rd June, 1948. (651663.)

15110. Imperial Chemical Industries, Ltd., Bennett, A., Prince, D. H., and Edwards, G. E.—Electrolytic cells. 30th May, 1949. (651664.)

16084. Philips Electrical, Ltd.—Coolers for discharge tubes. 15th June, 1948. (651551.)

16917. British Telecommunications Research, Ltd., and Baker, G. T.—Timing arrangements for use with electrical circuits. 6th May, 1949. (651553.)

16918. British Telecommunications Research, Ltd., and Baker, G. T.—Electrical recording arrangements. 16th May, 1949. (651554.)

17195. General Electric Co., Ltd., and Valentine, H. E.—Manufacture of hermetically sealed lengths of bent glass tubing, especially electric discharge lamp envelopes. 27th May, 1949. (651571.)

17962. Ericsson Telephones, Ltd., and Crowe, D. C.—Electro-magnetic devices. 29th June, 1949. (651491.)

19765. General Electric Co., Ltd., and Williams, C. E.—Rectifying arrangements for supplying a resistive load. 7th December, 1949. (651583.)

20394. Dorman, S. R. C.—Electric circuits for frequency dividing. 29th July, 1949. (651590.)

20855. Smitsvonk, N. V.—Electric igniting apparatus. 6th August, 1948. (651592.)

20930. Philips Electrical, Ltd.—Superheterodyne receivers. 9th August, 1948. (651594.)

21589. General Electric Co., Ltd., and Miles, E. E.—Methods of attaching a conductor to the exterior surface of an electric discharge lamp envelope. 2nd September, 1949. (651492.)

22055. Hughes & Son, Ltd., H., Whitfield, H. R., and Harrison, A.—Propagation of electromagnetic waves. 5th August, 1949. (651495.)

23721. General Electric Co., Ltd., Collyer, J. E., and Fairbairn, E. P.—Radio telephone systems. 29th July, 1949. (651604.)

23990. Naamlooze Vennootschap Philips Gloeilampenfabrieken.—Cross-bar switches for use in automatic

telephone system. 13th September, 1948. (Addition to 647506.) (651607.)

24632. Soc. Anon. de Télécommunications.—Seamed tubular electrical conductors and a method of manufacturing the same. 20th September, 1948. (651497.)

25346. Wynne-Jones, W. F. K., Beck, W. H., and Doran, R. J.—Manufacture of electric accumulator plates. 23rd August, 1949. (651614.)

25347. Wynne-Jones, W. F. K., Beck, W. H., and Doran, R. J.—Lead-dioxide electrodes for lead-acid cells. 29th August, 1949. (651615.)

26470. Day, A. S.—Illuminating and display devices. 11th November, 1949. (651563.)

26479. British Insulated Callender's Cables, Ltd., Richardson, A. B. F. G., Tunnicliff, E., and Fisher, I. K.—Sealing glands. 10th October, 1949. (651622.)

26480. British Insulated Callender's Cables, Ltd., Richardson, A. B. F. G., Tunnicliff, E., and Fisher, I. K.—Covering of electric conductors and cable cores with rubber or similar material. 10th October, 1949. (651623.)

28396. Automatic Telephone & Electric Co., Ltd., Smith, S. R., and Barrett, H. W.—contact springsets in electrical switching apparatus. 15th October, 1949. (651502.)

28722. British Insulated Callender's Cables, Ltd., Richardson, A. B. F. G., Tunnicliff, E., and Fisher, I. K.—Sealing glands. 3rd November, 1949. (651634.)

30378. Electrolux, Ltd. (Aktiebolaget Elektrolux).—Manipulating handles of electrical household apparatus. 23rd November, 1948. (651504.)

31193. General Electric Co., Ltd., Bonhomme, V. G., and Wardle, A.—Automatic or semi-automatic telephone systems. 20th October, 1949. (651693.)

31375. Metropolitan-Vickers Electrical Co., Ltd.—Electrical induction apparatus. 3rd December, 1948. (651506.)

31684. British Vacuum Cleaner & Engineering Co., Ltd., and Murray-Barber, D.—Suction cleaners. 1st December, 1949. (651698.)

31933. British Messier, Ltd., and Conway, H. G.—Electro-hydraulic actuators. 3rd November, 1949. (651565.)

32933. Allmanna Svenska Elektriska Aktiebolaget.—Liquid-electrode type ionic valves having resistance igniters. 21st December, 1948. (651703.)

1949

6772. Poittevin, M.—X-ray tubes. 22nd November, 1946. (Divided out of 651455.) (651507.)

20508. Welwyn Laboratories, Ltd., and Browning, J.—Resistors. 19th October, 1949. (651567.)

32620. British Tabulating Machine Co., Ltd.—Electric circuits. 20th December, 1949. (651570.)

NEXT WEEK'S EVENTS

Monday, 26th February

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio Group. "Fifty Years' Development in Telephone and Telegraph Transmission in Relation to the Work of Oliver Heaviside," by Dr. W. G. Radley.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Utilization Group. "Electrical Installations in Large Chemical Factories," by D. B. Hogg.

MANCHESTER.—Engineers' Club, Albert Square, 7 p.m. I.E.E. North-Western Centre. "Metallurgical Research at the Manchester University," by Prof. F. C. Thompson.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Transients in Electric Mine Winders and their Effects on Rope Stresses," by T. H. Petch.

Tuesday, 27th February

GLASGOW.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 7 p.m. I.E.E. Scottish Centre. "Some Electrical Methods of Measuring Mechanical Quantities," by F. J. Woodcock.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. Discussion on "Electrical Measurement by Thermal Effects," opened by Prof. J. Greig, Dr. L. G. A. Sims and Dr. J. G. Freeman.

Manson House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "The Measurement of Surface Temperature," by Dr. R. C. Parker.

Wednesday, 28th February

BRIGHTON.—Technical College, 6.30 p.m. I.E.E. Southern Centre. District Meeting. I.E.E. Report on the Education and Training of Electrical Technicians. Discussion opened by J. W. Thomas.

LIVERPOOL.—Philharmonic Hall, Hope Street, 6.45 p.m. I.E.E. Mersey and North Wales Centre. Faraday Lecture. "Lamps and Lighting—A Record of Industrial Research," by L. J. Davies.

LONDON.—Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. I.E.S. Informal meeting. Discussion—"Assessment of Lighting: Instruments or Instinct?"

Thursday, 1st March

BATH.—Electricity Showrooms, 7 p.m. I.E.E. Bristol Students' Section. Short papers evening.

EXETER.—Agricultural House, Queen Street, 7 p.m. I.E.S. Exeter Group. "Illumination and Illusion," by P. Hartill.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. "The London-Birmingham Television and Radio-Relay Link," by R. J. Clayton, Dr. D. C. Espley, G. W. S. Griffiths and J. M. C. Pinkham. (Radio Section paper.)

Friday, 2nd March

BATH.—S.W.E.B. Showrooms, 7 p.m. I.E.S. Bath and Bristol Centre. "Illumination and Illusion," by P. Hartill.

BIRMINGHAM.—Grand Hotel. Birmingham Electric Club. Annual dinner.

NEWCASTLE-ON-TYNE.—King's College, 6.30 p.m. I.E.E. North Eastern Students' Section. "The Schlieren System," by B. Berger.

STONE.—Crown Hotel, 7 for 7.30 p.m. I.E.E. North Staffordshire Sub-Centre. Annual dinner and visit of President.

Saturday, 3rd March

BRADFORD.—Technical College, 2.30 p.m. I.E.E. North Midland Students' Section. "The Van de Graffe D.C. Generator," by J. A. Henry.

LONDON.—I.E.E. London Students' Section, 10.30 a.m. Visit to Royal Opera House, Covent Garden, W.C.2. (Stage lighting.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Belfast.—16th March. City Council. Cabling. (See this issue.)

Bradford.—24th March. Dismantling and removal of redundant switchgear and wiring and supply and installation of new switchgear and wiring at Dumb Mills. (See this issue.)

Brighouse.—10th March. Borough Council. Street lighting standards, lanterns and fittings, Bradford-Huddersfield road. (See 16th February issue.)

Cheadle & Gatley.—28th February. U.D.C. Street lighting equipment for the year ending 31st March, 1952. (See 16th February issue.)

Devizes.—13th March. Corporation. Street lighting equipment. (See this issue.)

Isle of Ely.—19th March. County Council. Electrical installation in proposed junior and infants' school, Wisbech. (See this issue.)

New Zealand.—AUCKLAND.—2nd April. Auckland Electric Power Board. Two 10,000 kVA three-phase transformers. (C.R.E. (I.B.) 53366/51. Ten/2144.)*

Sunderland.—10th March. Town Council. Electrical installations, Hylton Red House estate. (See this issue.)

Thailand.—BANGKOK.—16th March. Stores Division, Railway Department. Supply of 282 sets of telephone block instruments. (C.R.E. (I.B.) 53446/51. Ten/2151.)*

Turkey.—ANKARA.—9th March. Directorate-General, Post, Telegraph and Telephones Department. Supply of 11,000 automatic telephones. (C.R.E. (I.B.) 53256/51. Ten/2147.)*

ORDERS PLACED

Burnley.—Corporation Housing Committee. Installation of electricity in 32 houses on the Brunshaw estate (£1,195).—Corporation Works Department.

Carlisle.—Corporation Education Committee. Electrical work at new Belah Primary School (£2,015).—David Thomson & Sons, Ltd.

London.—County Council. Accepted. Electrical installation at the Tennyson School, Battersea.—Alpha Mfg. & Electrical Co., Ltd.

Newcastle-on-Tyne.—City Council. Electrical installations in 98 houses on the St. Anthony's estate (£840).—S. G. Meikle.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Houses (90), Dunnyshop Farm site; borough surveyor.

Alcester.—Housing scheme, Studley, for R.D.C.; F. B. Andrews & Son, architects, 95, Colmore Row, Birmingham, 3.

Birmingham.—Extensive adaptations, etc., at old Metropole Theatre, Snow Hill, for headquarters and residential accommodation; secretary, Y.M.C.A., Dale End, Birmingham.

R.C. secondary school, Kings Heath; W. J. Whittall & Sons, Ltd., 132, Lancaster Street, Birmingham.

Bradford.—Two ward blocks for mental patients, Westwood Hospital, Cooper Lane; W. A. Shee, secretary to the Leeds Regional Hospital Board, 29/31, Eastgate, Leeds, 2.

Brierley Hill.—Civic centre, first section (£58,000), for U.D.C.; R. H. J. Comber, surveyor, Hawbush House, Brettell Lane.

Bristol.—Departmental stores; Upsons, Ltd., 7, Great Dover Street, London, S.E.1.

Brixworth (Northants).—Houses, Arthingworth (8), Chapel & Church Brampton (6), Marston Trussell (6), Naseby (6), Overstone (4), Spratton (16) and Walgrave (10); F. A. Russell, surveyor to R.D.C.

Cheltenham.—Flats (207), Hesters Way estate; Louis de Soissons and Partners, architects, 3, Park Square Mews, N.W.1.

Coventry.—Wholesale vegetable & fruit market (£306,128); D. E. E. Gibson, city architect, 1a, Warwick Row,

Droitwich.—Houses (54), etc., at Wychbold, for R.D.C.; R. F. Fry, surveyor, Ombersley Street.

Durham.—Workshops and laboratories for the new Mid-Tyne Technical College at Hebburn (£138,000); John Jackson & Sons, builders, Corporation Street, Newcastle-on-Tyne.

Edinburgh.—Houses (302), The Inch, Liberton (£477,000); city engineer, 329, High Street.

Medical buildings, George Square, for University authorities; W. N. Ramsey, architect, Sauchiehall Street, Glasgow.

Gateshead.—Extensions to G. Davidson & Co.'s glassworks; Bewley and Scott, Dunston.

Glasgow.—Primary school, Barmulloch; J. W. Manson, architect, 15, Blythswood Square.

Factory extensions; James Macfarlane & Co. (Pollokshaws), Ltd., Riverford Road.

Hindley.—Houses (32) for U.D.C.; J. Gaffney & Son, 277, Whelley, Wigan.

Liphook (Hants).—Nurses' home at King George Sanatorium for Sailors; R. Holford & Co., Ltd., builders, Walnut Tree Close, Guildford.

Liverpool.—Technical college for women, Colquitt Street; director of housing, Blackburn Chambers, Dale Street.

Heavy haulage depot, offices and warehouses, Shaw Road, Speke; Road Haulage Executive, 23, Old Hall Street.

Flats at Breck Road and Northcote Street (12), Avison Street area (18) and Pallas Street area (30 flats and 4 houses); Netherton Building & Construction Co., Ltd., Church Road, Liverpool.

London.—Office block, fronting Charing Cross Road and Leicester Square; H. Fairweather & Co., Ltd., Hyde Works, St. James' Lane, N.10.

PUTNEY.—Flats (227), Chartfield Avenue, for L.C.C.; Lanchester & Lodge, architects, 10, Woburn Square, W.C.1.

SYDENHAM.—Flats (60), West Hill; P. W. Dawney & Carpenter, architects, 131, Victoria Street, S.W.1.

Longbenton.—Houses (48), Crossley Terrace, for the U.D.C.; W. Leech, Ltd., builders, 2, Clayton Street, Newcastle-on-Tyne.

Louth.—Houses (32), Eastfield Road estate; Vallance & Westwick, architects, White Hart Chambers, Mansfield.

Manchester.—Bus garage (£220,000), Park Road, Stretford; city architect.

Offices and laboratories: Imperial Chemical Industries, Ltd., Hexagon House, Blackley.

Northumberland.—Child welfare centre at Morpeth (£12,000); county architect, County Hall, Newcastle.

Ossett.—Houses (50), Swithenbank; borough surveyor.

Penzance.—Houses (30), Alverton estate; borough surveyor.

Rotherham.—Houses (143), Broom Valley estate; O. Weaver & Sons, Ltd., Harlington Road, Mexborough.

Sheffield.—Houses (178), Basegreen estate; W. G. Davies, city architect.

Smethwick.—Factory extensions; Alberts Manufacturing Co., Ltd., Oldbury Road.

South Shields.—New factories for the T.C. at Waterloo Vale to be let to firms displaced by Council's development programme; borough engineer.

Stanley (Co. Durham).—Ball bearings factory at Annfield Plain for Ransome and Marles, Ltd.; Taylor and Napper, architects, 56, Eldon Place, Newcastle-on-Tyne.

Wakefield.—Houses (40), Eastmoor, and 14 at Darnley estate; Spooners (Hull), Ltd., Glebe Road, Stoneferry, Hull.

County supplies department block (£56,000); county architect.

Wallsend.—Extensions to Civic Hall (£10,000); R. Burke, Lambton House, Lambton Road, Newcastle-on-Tyne.

West Bromwich.—Factory; Midland Candle Co., Ltd., Heath Lane, Stone Cross, West Bromwich.

Wolverhampton.—Laboratory at Royal Hospital, Cleveland Road, for Medical Research Council; Abbey and Hanson, architects, Cloth Hall Street, Huddersfield.

Electrical Commercial Travellers

THE annual luncheon of the Electrical Trades Commercial Travellers' Association held at the Connaught Rooms, London, last Friday, attracted an attendance of 500. Mr. L. A. Fickling, chairman of the Association, presided. The guest of honour was Lord Mancroft, M.B.E., who, in proposing the toast of the Association, said that in these days much of the individual responsibility had been taken over by the State. There were, however, those whose needs were not covered by Acts of Parliament and there was still need for the ordinary man in the street to come to the aid of his fellow beings. The Association was one of the organizations which helped those who were in need.

Mr. H. A. Deacon referred to the appeal by last year's president that each member should endeavour to enrol one new member. There was still room in the Association for new members, and he said it was worth while augmenting State aid by taking an interest in such organizations as the E.T.C.T.A.

Mr. L. L. Hughes proposed the toast of the guests and Mr. F. French, in reply, said that the commercial traveller was a man who showed great patience and tenacity of purpose. The work of electrical travellers in promoting the sale of electrical appliances had been almost too successful.

Mr. G. L. Elvey, in proposing the toast of the chairman, reviewed the history of the Association and mentioned that it had contributed over £2,000 to charities apart from its own benevolent fund. An appeal for support by increasing membership of the Association was made by Mr. Fickling in his reply. He would like to see the membership raised to 1,000 during his year of office. He mentioned the forthcoming garden party to be held at the Royal Commercial Travellers Schools in June next. There was to be a sale of goods, and contributions of any kind would be gratefully received.

Mr. S. Johnstone, the charity steward, in making an appeal for the Association's charities, mentioned that last November they had donated 225 gns to the Royal Commercial Travellers Schools and the Electrical Industries Benevolent Association. A collection made during the lunch totalled over £100.